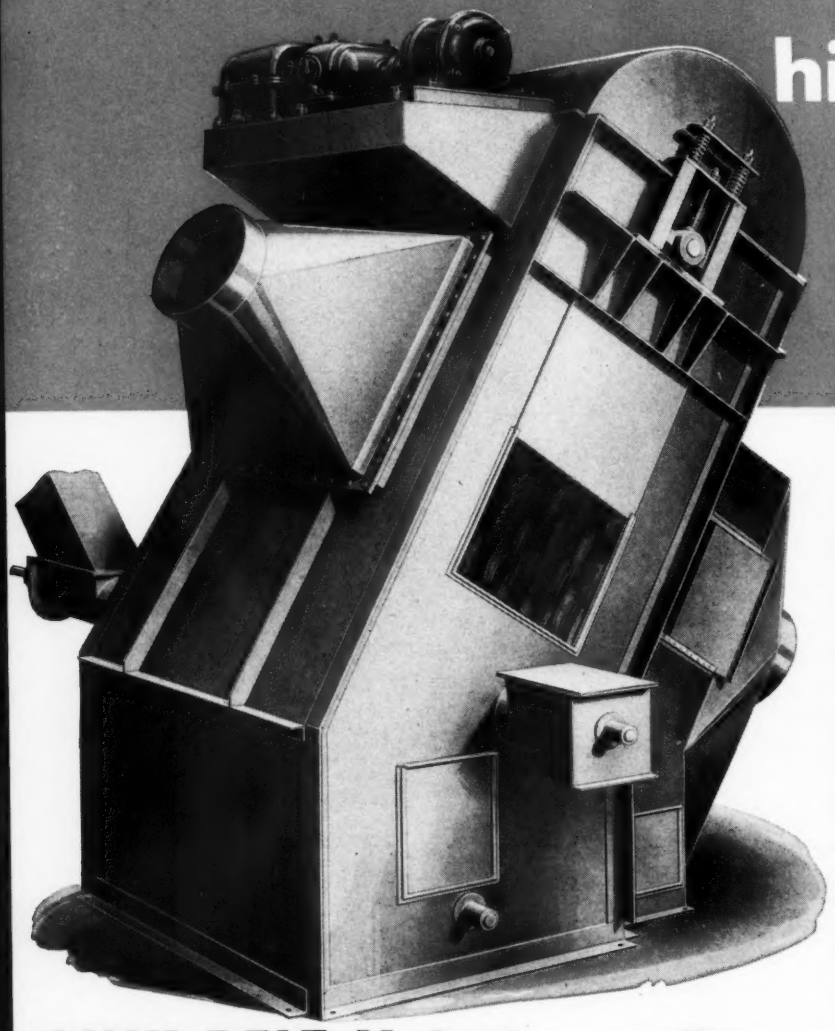
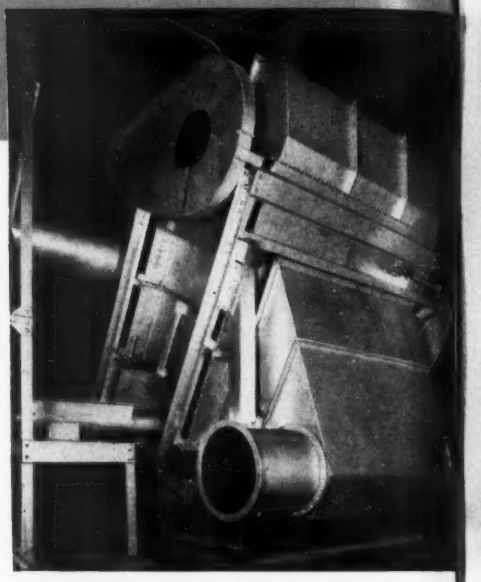
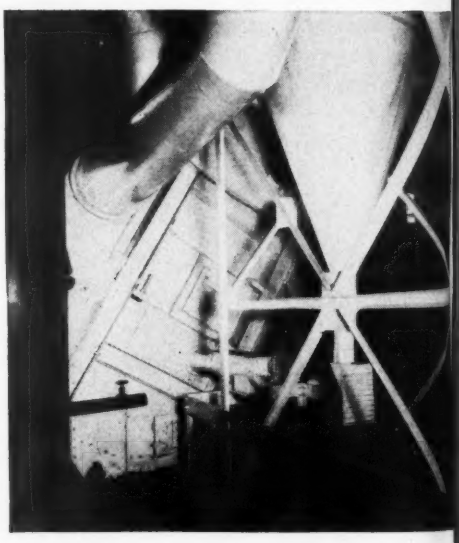
Mining CONGRESS JOURNAL

The answer to the problem of high moisture COAL







LINK-BELT *Multi-Louvre Dryer*

Another step forward in coal preparation technology. The Multi-Louvre is *the* low-cost, high-efficiency unit for drying coal. It is outstanding for many reasons, such as:

—Exceptionally low horsepower requirements.

—First cost lower than conventional types of coal dryers.

—Minimum of degradation.

—Short contact time with the drying air; large pieces do not tend to overheat.

—The dryer that successfully handles fine coal without breakage or oxidation.

—Simplicity in control of temperatures and volume of drying air.

—Cooling section may be very easily added, for cool discharge into cars or bins.

—Operation and maintenance extremely simple and economical. It is essentially an apron conveyor.

Illustrations at the right show details of a typical installation drying coal for coking purposes. Why not call on one of our engineers to give you the complete story? Send for Book No. 2209.

LINK-BELT COMPANY Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

As a mine foreman I know from Experience...

"...WHEN WE'RE WORKING IN LIMITED HEAD ROOM GIVE ME THE "AUTOMAT" FOR LOADING CARS TO FULL CAPACITY."

Mining men who use the Whaley "Automat" know that loading cars to full capacity in limited head room is no problem for the "Automat." This is because the rear conveyor is always parallel to the top of the car for the full length of conveyor at any height to which the conveyor is set. This exclusive "Automat" feature is due to the Parallel Lift Rear Conveyor. Height of conveyor is hydraulically controlled at operator's position and the parallel feature is automatic. Looking at the picture above, it's easy to see how the automatic parallel conveyor permits taking advantage of every inch of available head room. With no upward angle of conveyor over car to interfere, this important feature of the "Automat" makes it possible to load maximum height cars to their full capacity. This is another most important reason why, for more effective loader service, you should choose the safe, shovel action "Automat." Myers-Whaley Co., Knoxville 6, Tennessee.

Remember, the "Automat" loads, in its stride, any lump of coal that will pass through your tipple or any lump of rock your cars, aerial tram or larries can take.

Myers Whaley

Mechanical Loaders Exclusively for Over 40 Years.

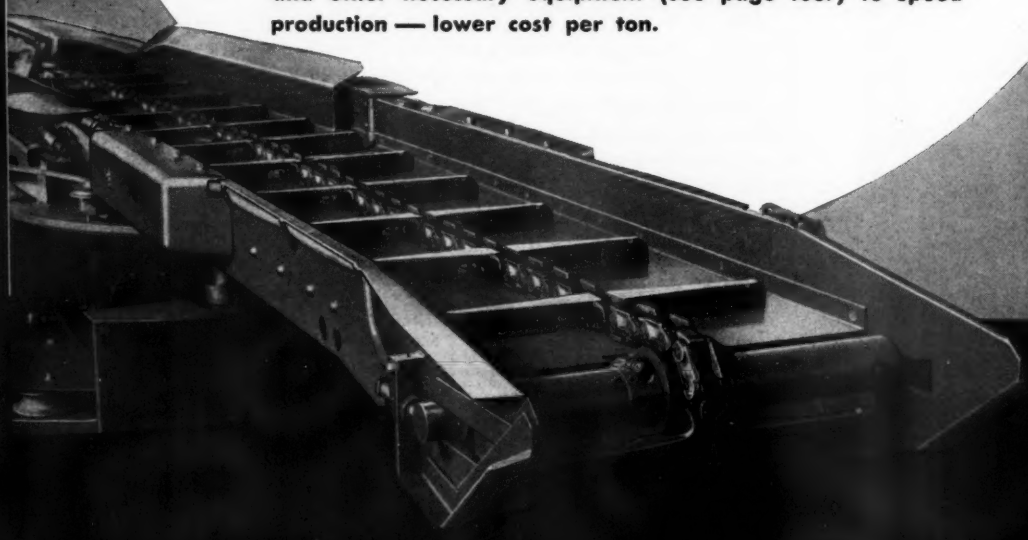
AN IMPORTANT COG IN MECHANICAL PRODUCTION OF COAL

JEFFREY
L-600 LOADER

Ample capacity always available when needed . . "Down-Time" reduced to a minimum . . when a Jeffrey L-600 Loader is on the job. Designed and built to handle large tonnages, day after day, under all kinds of operating conditions, these big machines will provide exceptionally low-cost operation.

Finger-tip hydraulic control . . automatic cable reel . . high capacity for mines with seams ranging from three and one-half feet upward. The Jeffrey L-600 is particularly suited to room and pillar mining in panels, block system or other methods of pillar recovery.

Also loaders and conveyor-loaders specifically adapted to low seam operations; shuttle cars, underground conveyors and other necessary equipment (see page four) to speed production — lower cost per ton.



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describes the world's largest line of cemented carbide mining tools

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4. Minimize maintenance
5. Balance your operation
6. Increase your output

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The reason for their outstanding performance is the *durable cutting edge of Kennametal,* the cemented carbide that has compressive strength 2 to 3 times greater than steel, is far harder than steel, and withstands shock, abrasion and wear far better than any other tool metal.

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CORE BITS

MINING DIVISION

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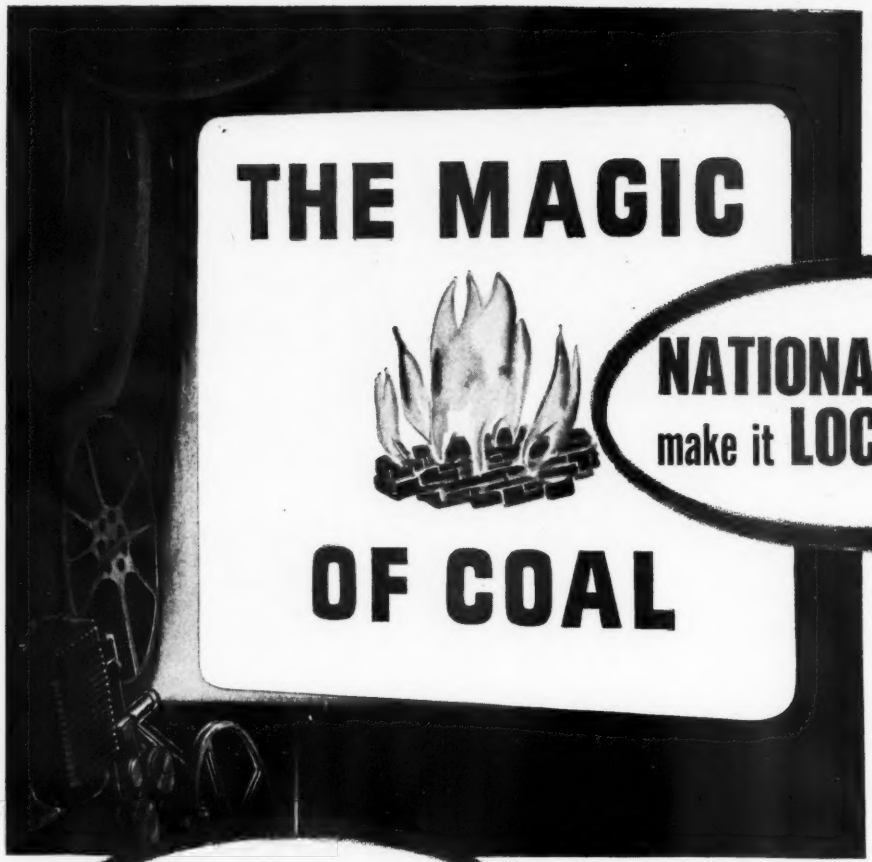

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Here's how YOU can get this important film to show in your community

This 18-minute, 16-mm. motion picture . . . giving a dramatic view of coal and coal mining, from modern mining methods to uses of coal and its by-products . . . is available *now* for business meetings, school groups, and club showings in your community. It is another way to tell the important story of bituminous coal to all your customers and potential customers.

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The Model T Rear-Dump Euclid has abundant power and speed for steep grades. Distribution of weight and large tires result in excellent traction and flotation.

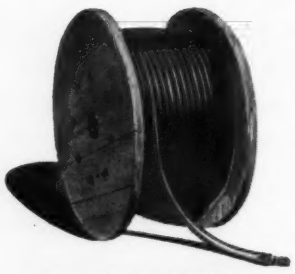
Dumping 22 tons of iron ore into drive-over hopper on the Mesabi Range in Minnesota. Load is shed quickly because of smooth body interior and high dumping angle.

DESIGNED to work with large loading equipment, the Model T Euclid has extra large capacity and unusual power and speed for steep grades. Low loading height, large top area, fast hoist action, high dumping angle, exceptional maneuverability and traction, and high ratio of horsepower to weight . . . all of these Euclid features contribute to efficient performance.

This model has a struck measure capacity of 14.8 cu. yds. and payload capacity of 44,000 lbs. Powered by Diesel engine of 225 to 275 h.p. rating, top speed with capacity payload is 32.3 m.p.h. Hydraulic steering is standard equipment. The drive axle is full-floating and planetary type double-reduction, built for big loads, large engines, and heavy service.

Wherever extra capacity and power are required to move large yardages on difficult hauls, the Model T will do the job with speed and efficiency.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio



The BIG DIFFERENCE is in your COSTS!

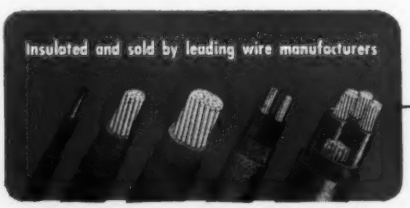
Power and feeder cables with Alcoa E.C.* Aluminum conductor cost less to ship, less to install, and a lot less to buy. Its lighter weight, for example, can mean only two men for installation where you used to use four. Lower transportation costs, too. And prices on bigger sizes can give you as much as 50% saving on cable costs.

You can get a power bonus, too. The bigger sizes usually specified when aluminum replaces copper mean less voltage drop—more power to working faces. Acid mine waters don't faze aluminum, either. On your next cable installation, ask your chief electrician to *figure it in aluminum.*

Alcoa makes light, strong, conductive E.C. Aluminum. Leading wire and cable manufacturers draw, strand, and insulate it, and sell it under their own trade-marks.

Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 1764 Gulf Building, Pittsburgh 19, Pennsylvania.

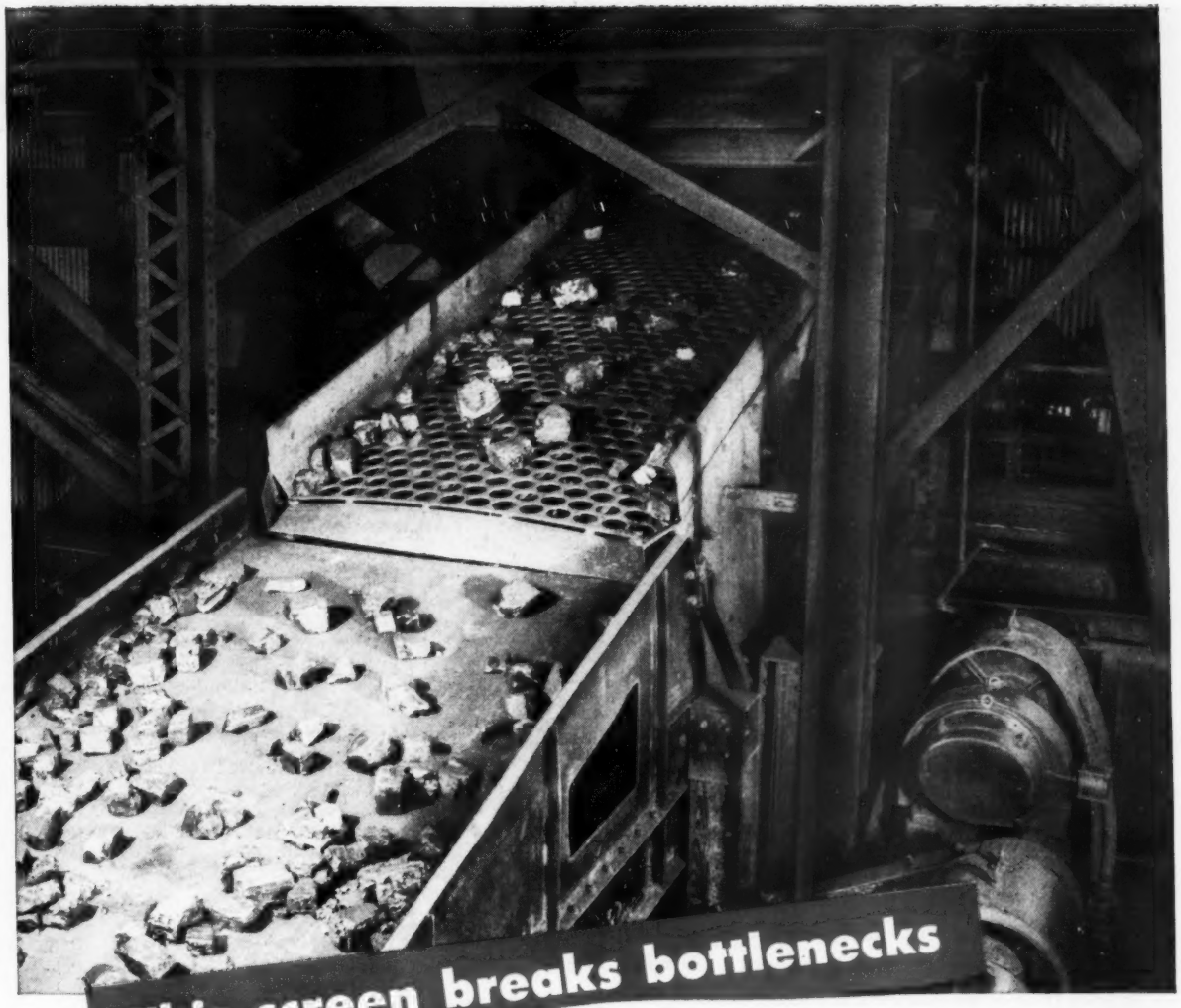
*E.C.: *Electrical Conductor* Aluminum



ALCOA EC ALUMINUM

ALCOA ALUMINUM

FOR ELECTRIC WIRE AND CABLE



This screen breaks bottlenecks

ROBINS GYREX SCREEN SIZES HEAVY LOADS OF COKE . . . COAL . . . ORE . . . FASTER, MORE ACCURATELY

You open up two common bottlenecks when you make size with a Robins Gyrex Screen.

First, you eliminate the costly delays caused by sorting at a slow rate. Your Robins Gyrex Screen works *fast* . . . sorts hundreds of tons of material *every hour*.

Second, you eliminate any need for rehandling the material over and over to get proper size. Your Robins Gyrex Screen separates as many as five different sizes at once . . . with mechanical accuracy.

There are many good reasons why the Robins Gyrex Screen can size any of dozens of materials faster and more accurately. For example:

It's flexible. Its slope is adjustable from horizontal to 28° to suit changing load requirements.

It's powerful. Its positive eccentric vibrating shaft and anvil-type base frame are built to take overloads.

It's durable. Its screening surface is rubber-mounted and held drum-tight under spring tension to prevent the constant flexing that leads to crystallization.

Why not get full particulars about the Robins Gyrex Screen today? Learn how it can break the bottlenecks on your work, too.

ROBINS

Gyrex Screens

SEND TODAY for information regarding features, advantages and benefits of efficient Gyrex Screens. Address your letter to Robins Conveyors Division, 270 Passaic Avenue, Passaic, New Jersey.

ROBINS CONVEYORS DIVISION **HEWITT-ROBINS INCORPORATED**

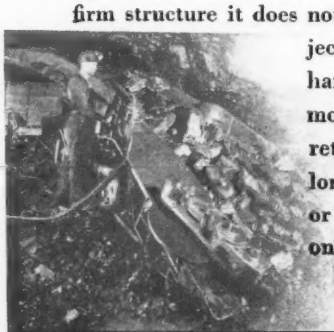
Your Coal Is Better

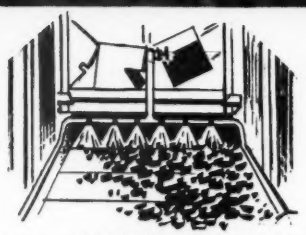
THAN IT IS CRACKED UP TO BE

Once the detonation of explosives has introduced shatter-cracks into coal, little can be done to decrease progressively costly degradation.

CARDOX limits degradation at the working face where it begins. The gentle, heaving action of CARDOX breaks the face along its natural lines of cleavage. The coal is firm, solid, and remarkably free from the minute shatter-cracks that cause rapid degradation at every preparation and handling operation.

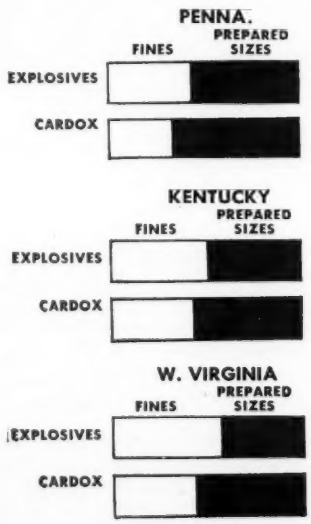
Because CARDOX-mined coal retains its inherently firm structure it does not crumble even though subjected to extensive mechanical handling. For this reason it is more economical to clean, and retains its premium size through long shipments by train, boat, or truck. Write for full details on free demonstration.





Because CARDOX-mined coal has no shatter-cracks, it does not crumble when subjected to extensive cleaning and mechanical handling.

Typical Realization Increases when CARDOX replaces explosives.



CARDOX

"THE NON-EXPLOSIVE MINING METHOD"

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS

STANDARD ENGINEER'S REPORT

RPM CALOL

TEST DATA

UNIT 6 Cyl. gas Truck + Bus Engine

LUBRICANT RPM Heavy Duty Motor Oil

FUEL Chevron Gasoline

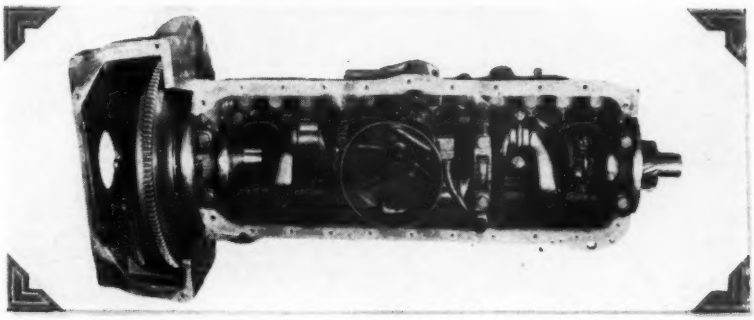
CONDITIONS max. engine loads for prolonged periods

FIRM Mountain Auto Line

LOCATION San Bernardino, Calif.

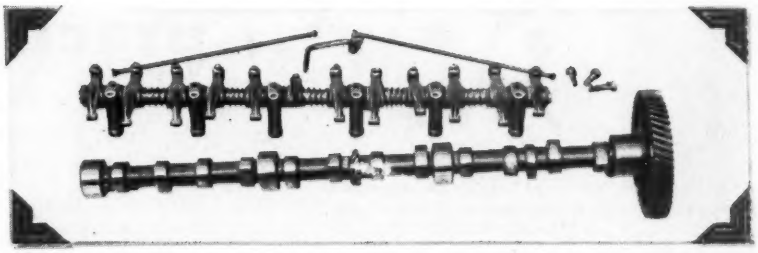
TOUGHEST MOUNTAIN SERVICE PROVES RPM HEAVY DUTY KEEPS TRUCK AND BUS ENGINES CLEAN

When this engine was pulled out of service for inspection, and the photographs were taken, it had operated on RPM Heavy Duty Motor Oil continuously for 45,000 miles—in service that is about as hard on equipment as any in the country. It is one of 21 units used on a mountain bus and freight run. They climb to a 5000-foot altitude in 15 miles without a stop. Even with 6-bladed fans, pressure-lubricated timing gears and 10-speed transmissions, crankcase temperatures soar above 240 degrees F.



As the pictures at right and above show, the crankshaft, bearings, pistons and rings from the engine were exceptionally clean. RPM Heavy Duty Motor Oil withstands the highest operating temperatures . . . sticks to the hot spots ordinary oils leave bare.

The camshaft was free from lacquer. Pushrods, timing gears and other parts showed minimum wear. RPM Heavy Duty Motor Oil resists oxidation, cleans engines of lacquer and maintains a tough lubricating film. It does this because of inherent properties of its selected base stocks and special compounds.



REMARKS: Many oils, competitive to RPM Heavy Duty Motor Oil, have been tested by Mountain Auto Line in their regular service. Tests have been made in all seasons of the year with atmospheric temperatures ranging from zero to 100°F. above zero in the shade. RPM Heavy Duty Motor Oil is the only oil used that meets every requirement of their engines and prevents clogging with lacquer.

STANDARD TECHNICAL SERVICE conducted and reported this test: If you have a lubrication or fuel problem, your Standard Fuel and Lubricant Engineer or Representative will give you expert help; or write Standard of California, 225 Bush Street, San Francisco 20.

Trade marks "RPM," "Calol" Reg. U. S. Pat. Off.

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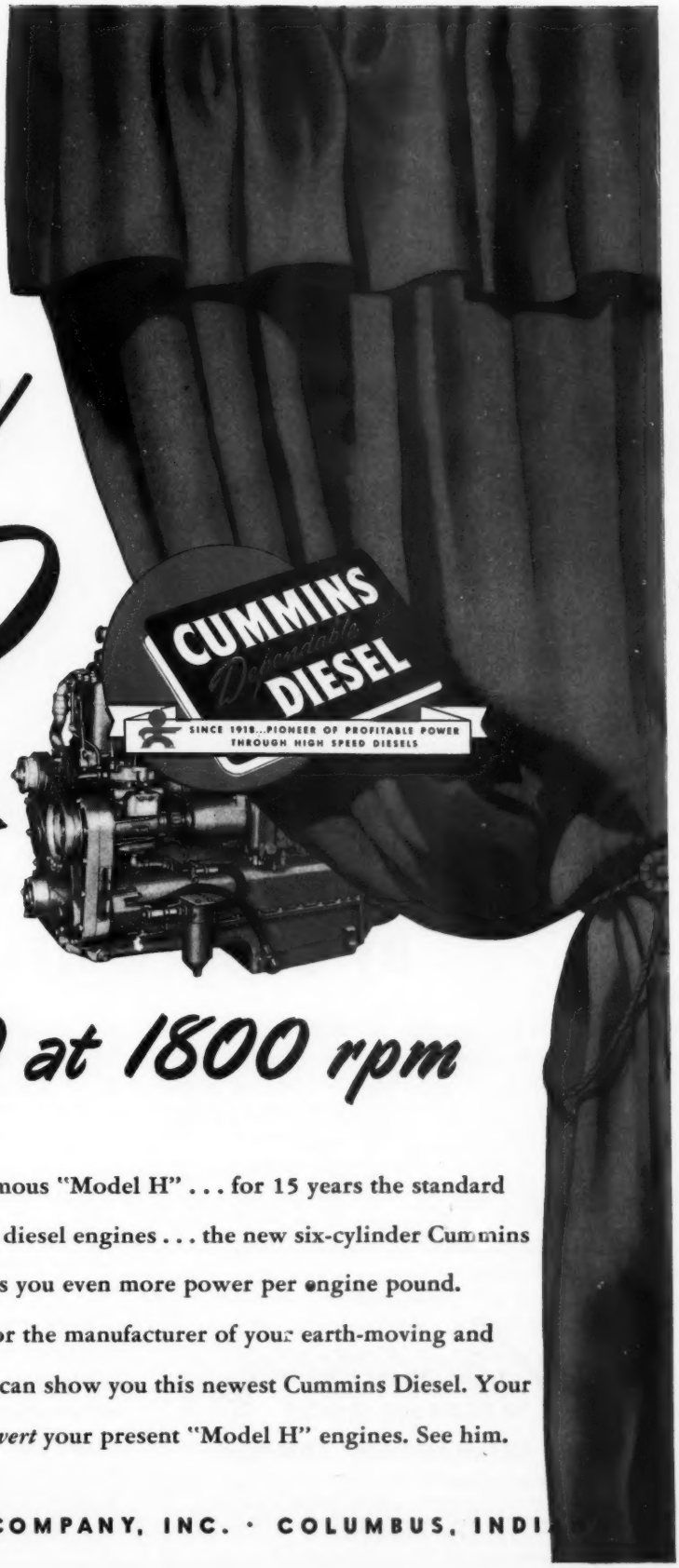
the NEW HR

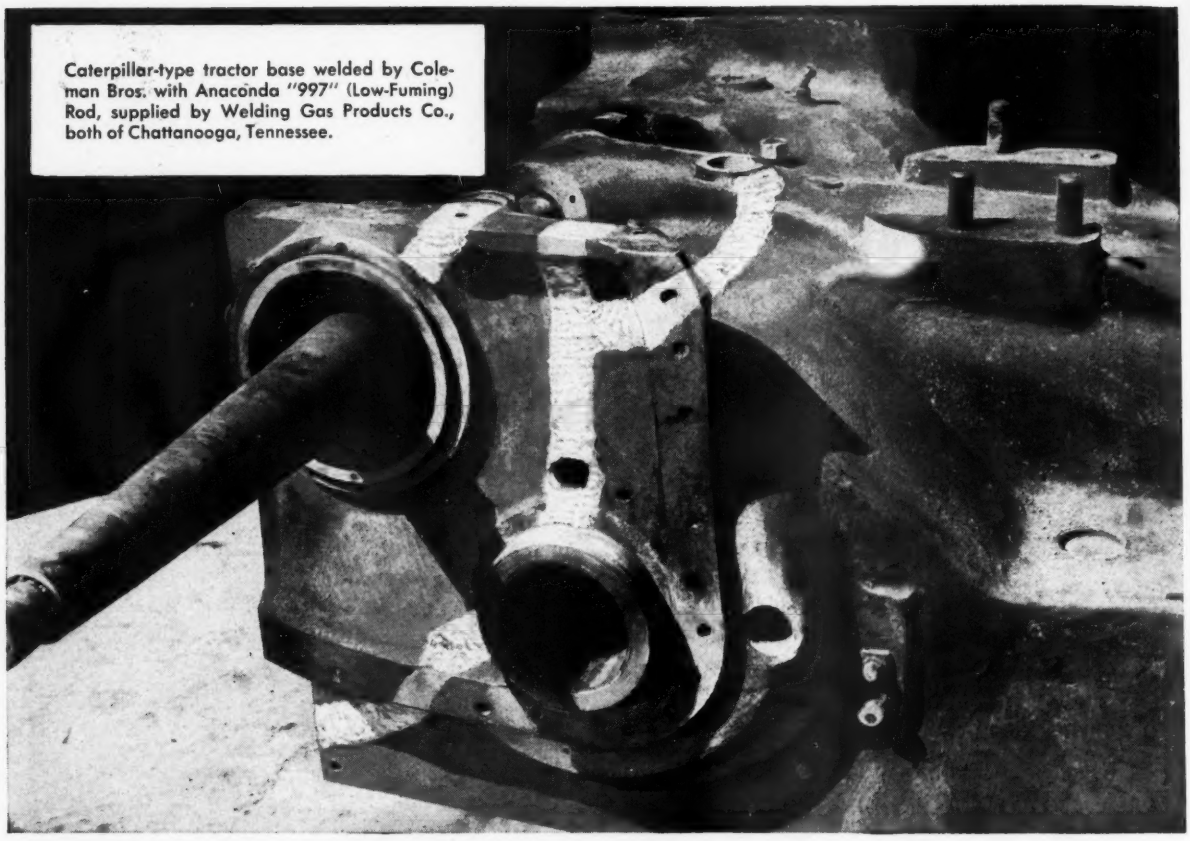


165 hp at 1800 rpm

Similar in design to the famous "Model H" . . . for 15 years the standard of comparison for high-speed diesel engines . . . the new six-cylinder Cummins HR-600 Engine offers you even more power per engine pound.

Your Cummins Dealer or the manufacturer of your earth-moving and material-handling equipment can show you this newest Cummins Diesel. Your Cummins Dealer can also *convert* your present "Model H" engines. See him.

CUMMINS ENGINE COMPANY, INC. · COLUMBUS, INDI



Caterpillar-type tractor base welded by Coleman Bros. with Anaconda "997" (Low-Fuming) Rod, supplied by Welding Gas Products Co., both of Chattanooga, Tennessee.

$1,275 AND SEVERAL WEEKS' DOWNTIME SAVED BY BRONZE WELDING

IT LOOKED LIKE a costly accident when a caterpillar-type tractor in Chattanooga cracked its 2,000-lb. base. A new base would cost about $1,500 with several weeks for delivery. But bronze welding came to the rescue!

Twenty pounds of Anaconda "997" (Low-Fuming) Rod was used in the 67-inch weld. Grinding, preheating and oxy-acetylene welding took only 20 man-hours. Total cost of repair: $225. And the tractor was back on the job in a few days. Moral: If your heavy equipment cracks or wears down—remember bronze welding.

Almost any part made of cast iron, steel, malleable iron, or copper alloys can be bronze welded quickly—at small cost. And well-made bronze welds in cast iron are stronger than the base metal itself.

Furthermore, with the low temperatures used in bronze welding—the weld area surfaces only are usually brought to a cherry red heat. This means less chance for warping or cracking.

Get the full story on bronze welding with Anaconda Welding Rods. Send for your copy of Publication B-13 . . . today. 48159

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from mine to consumer

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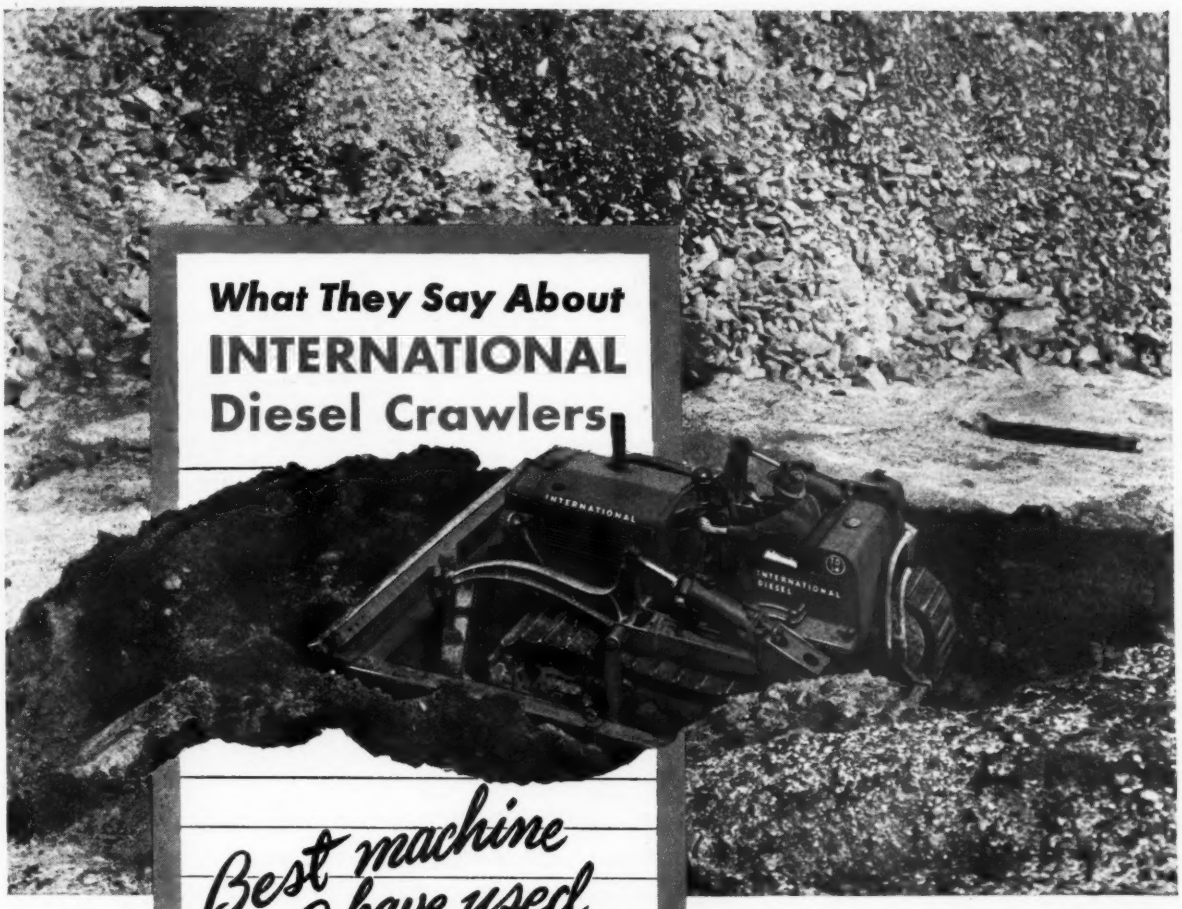

The International TD-14 Diesel Crawler with bull-grader shown above served Penbrook Drayage & Supply Co., Harrisburg, Pa., in coal stripping operations. "Best machine I have used to date," says its owner!

The endorsement of operators and owners of International Diesel Crawlers in the mining industry is the best answer to any question you may ask about the usefulness and economical operation of these mighty tractors.

In the many jobs they do so well: building and maintaining access roads, stripping overburden, moving spoil banks, feeding shovels and cleaning up; they are without equal.

The whole story of their superiority describes their many valuable features. They are sturdily built for rough and tough service. Advanced design fuel injection assures highly effective use of fuel. An all-weather starting system eliminates time-wasting starts. Tocco hardened crankshafts and other vital parts, and replaceable cylinder liners that are file hard, assure long wearing life. Full-pressure lubrication and efficient cooling systems make sure of dependable engine performance.

For complete specifications and other information about these tractors, International Diesel engines and matched equipment, consult your International Industrial Power Distributor. Let him assist in selecting tractors and equipment for your use.

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ONE SUCCESSFUL COAL CLEANING PLANT DESERVES ANOTHER

East Diamond Mine plant of the West Kentucky Coal Company—soon to be duplicated at the Company's Pleasant View Mine.

LET'S GET ACQUAINTED!

R and S is equipped to do the job complete . . . to plan and engineer coal preparation plants from the ground up . . . to furnish modern, automatic operating equipment long recognized as the best money can buy.

These informative bulletins—Nos. 166 and 171—fully describe the units in use in the above plant: the R and S Hydrotator and the R and S Tandem Hydro-Separator . . . each backed by 40-odd years of concentrated experience in coal preparation methods and machines. Write for copies . . . TODAY!

SOON another Roberts and Schaefer coal cleaning plant like the one pictured will rise above the Pleasant View Mine of the West Kentucky Coal Company.

There's deep significance in repeat-contracts like this—obvious proof that into R and S engineered plants go that extra measure of sound design and operating efficiency which makes success and maximum profit foregone conclusions.

Consider your own plant! Is it modern . . . economical . . . equal to the great need for more and better coal . . . safe from the inroads of competition?

If you haven't discussed modern, up-to-date coal preparation methods lately . . . with experts . . . it's very likely you are overlooking handsome profits that you're earning but not getting. Good way to find out is to consult Roberts and Schaefer . . . without obligation . . . with assurance of complete satisfaction if we are privileged to serve you.

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★ Mining CONGRESS JOURNAL ★

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
SHELDON P. WIMPFEN, *Editor*

VOLUME 34 OCTOBER, 1948 NUMBER 10

Production Peril

FREQUENTLY, the best laws are those that repeal already existing laws. Yet Americans, as individuals and joined together in productive enterprise, are being bound with more and more turns of the legal rope, made fast with the knots of regulation and the twists of interpretations. Currently under consideration for change, are the interpretations of the Wage-Hour Administrator which affect block leasing. The new interpretation on leasing is already in draft form and may soon be released.

Leasing is a traditional method of mining favored by enterprising miners who choose to pit their skill against the cost of mining and the risks of finding ore in the hope of procuring exceptional reward. The lessee or "leaser" is selected for his ability and diligence as a miner and is allocated a block of ground where he is allowed to conduct all development and extraction. Frequently leasers work on pillar extraction, on the fringes of known ore bodies, or on narrow veins requiring the careful mining that only a miner working on his own account will do. Often these individualists follow small stringers in the hope of finding new ore—in places where an operating company employing day's-pay miners might find such work impractical. Occasionally leasers are eminently successful in realizing their dreams "making a stake" for themselves.

The benefits derived from the enterprise of these independent contractors are far reaching. Aside from reaping rewards for themselves, their efforts add materially to the production of gold, silver, and the nonferrous metals.

According to the Social Security Administration about 10,000 mine "leasers" or "tributers" are now at work, principally in Arizona, California, Colorado, Idaho, Nevada, and Utah. Only the leasing system offers these resourceful miners an opportunity to be self-employed at their chosen profession.

Cornish miners, accustomed to the leasing system even before the adoption of the Stannaries Charter in 1201 A. D., introduced leasing in the famous Grass Valley-Nevada City District of California. There, among other successes, their efforts were a factor in finding sufficient new ore in the Idaho Maryland mine to make possible resumption of full-scale mining. Also, most of the production from the Empire and North Star mines since 1946 has been derived from ore produced from leases.

The Gearhart Resolution (H. J. Res. 296), amending the Internal Revenue Code and the Social Security Act, excluded from the provision of these laws individuals having the status of independent contractors under the usual common-law rules applicable in determining the employer-employe relationship. However, the Supreme Court has taken the view that these common-law rules are not wholly determinative as to employer-employe relations as regards statutes designed to implement a public, social, or economic policy.

Binding the hands of the small business man and independent contractor—the fellows who are willing to take a risk in order to make a profit—tends to substitute doubtful security for the wide-open opportunity that has been a basic factor in the economic success of these United States. It is our fervent hope, if a new interpretation must be thrust upon independent contractors, that it be a realistic one which will not limit nor restrict a well-established, important, and productive system.

Fluid Power from Coal

LIQUID fuels offer many conveniences sought by industry and individuals. They are readily transported, measured, and stored. Labor-saving equipment from lawnmowers to locomotives is powered by a variety of fluid fuels. Petroleum supplied 33 percent of the nation's 1947 fuel requirements, with coal in the leading position, furnishing 50 percent of the demand.

Coal, as a solid fuel, cannot equal liquid fuels for diversified use. But known coal reserves are sufficiently extensive to be measured in centuries, a unit that cannot be applied to other fuel reserves. So we have the paradoxical situation in which widely used and relatively efficient engines depend upon a fuel in short reserve when compared with coal.

The trend towards increased use of petroleum products moves on. In June the century-old shops of the American Locomotive Co. turned out their last steam locomotive to concentrate on the production of Diesel-electric equipment. Demand for gasoline-powered motor vehicles is unprecedented. The jet plane and gas-turbine developments will add to the debit side of the petroleum reserve ledger.

Recognizing the situation, several oil and coal companies are undertaking joint efforts to economically transform coal to fluid fuel. Until such time as atomic energy can be efficiently adapted to man's use, the vastness of coal reserves, the flexible productive capacity of the coal-mining industry, and the certainty of successful and economic synthesis practically guarantee the future of coal as our dominant source of energy.

Underground Shaker and Conveyor Belt Operatiom

Lower Tramming and Power Costs and Increased Production Realized from Shaker-Belt Installation

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and
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Sherwood Mine
Inland Steel Co.

DURING four years' experience with shaker conveyors, and two years' experience with belt conveyors, approximately 700,000 tons of iron ore have been moved over shaker conveyors, and approximately 400,000 tons of iron ore moved over belt conveyors. Experiments with the shaker conveyor were started in 1944, and this method of moving ore has gradually been adopted, with six shaker conveyors now in operation. The belt conveyors were installed in 1946, on a permanent basis, but since they were the first to be installed in an underground mine in this district, there were many experimental phases connected with the installation and initial operation.

The Inland Steel Co.'s Sherwood Mine, at which the shaker and belt conveyor combination is in use, is producing iron ore from the Menominee Range at Iron River, Mich. The entire property covers 80 acres, in which the ore is found at depths from 300 to 1600 ft below the surface. The ore is an enriched portion of iron formation and is a standard Menominee Range ore weighing approximately 125 lb per cu ft. The ore is classed as a semi-hard ore. Little timbering is required in the mining practice and the open-stope method is the predominant mining method.

At the Sherwood Mine, the two main haulage levels are the 1000-ft level and 1200-ft level. Each level consists of a crosscut drift south from the shaft to the ore body, and an east drift and a west drift within the ore body from the main crosscut to the property lines.

The ore is mined by a sublevel stoping method, leaving the stope open until mining is completed. The open area will be filled with surface material. The stopes are 80 ft wide; average 200 ft long, depending on the thickness of the ore; and vary from 150 ft to 300 ft in height. Between the stopes 40-ft pillars are left that are recovered so far as possible after the stopes have been completely mined out.

Shaker chutes were installed to replace the tugger and scraper method of moving ore in an effort to find a more efficient means of transporting material. Scraping is not efficient beyond distances of 150 to 200 ft because of the loss of time in hauling back the empty scraper. It also was felt that the operation of the shaker conveyor would prove to be safer than that of a tugger and scraper operation.

The first shaker conveyor experiments were conducted on the 1000-ft level with the discharge of the shakers trammed from a storage chute to the shaft pockets by trolley locomotive and car haulage. From these experiments and from a desire to experiment with belt conveyors, the combination shaker

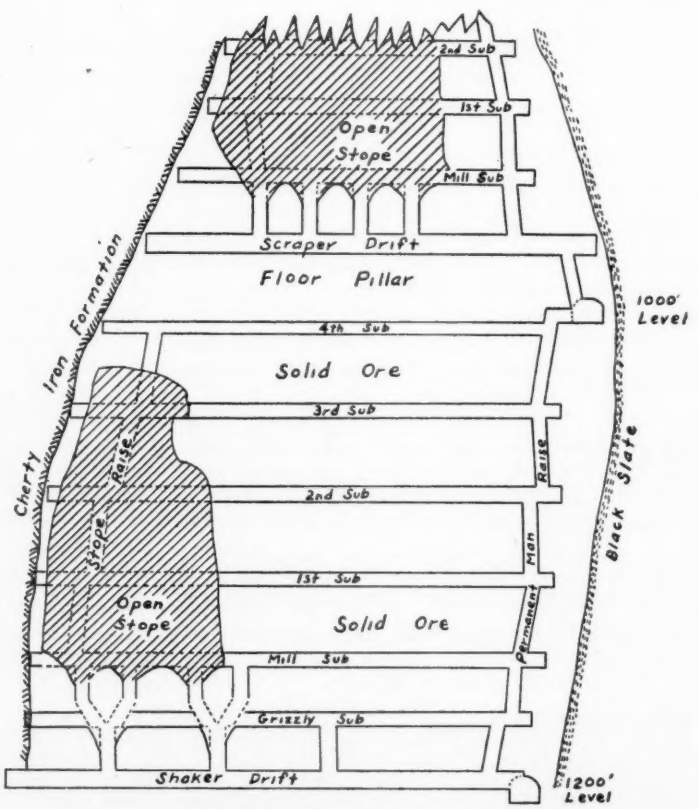


Fig. 1.—Section of typical stope in Sherwood mine. (1 in.=175ft)

chute-belt conveyor haulage system now installed on the 1200-ft level was conceived.

The decision to equip the 1200-ft level with belt conveyors for ore haulage rather than with trolley locomotives and tram cars was made in an effort to decrease tramming and power costs, increase production, reduce accidents, and decrease maintenance cost on haulage equipment.

Underground haulage is one of the principal direct costs of mining. In an attempt to reduce haulage costs, extensive experiments were conducted at the Sherwood Mine before a successful method of nearly continuous ore movement was devised. The knowledge gained in the installation and operation of this system will be of great value to operators striving towards increased efficiency and safety.

Original System Used Scrapers and Trams

Above the 1000-ft level, the original stopes were laid out in such a manner that the ore from the stopes would be handled by scrapers and by tram cars. The ore was broken from the solid by miners working on benches on the various sublevels within the stope. The broken ore dropped to the bottom of the stope through the mill raises to the transfer sublevel. Here the ore was scraped to a grizzly over a storage chute. After passing through the grizzly the ore was stored in the chute until drawn off into 5-ton cars and then trammed to the shaft with electric locomotives.

Main haulage units on the 1000-ft level consist of a 6-ton electric locomotive and a train of ten side-dump cars with a pay load of 5 tons each. The average distance from the stopes to the shaft is approximately 1500 ft. The cars are dumped at the shaft by air cylinders. The storage pocket at the shaft has a capacity of approximately 250 tons, and the ore is hoisted from these pockets to the surface in 6-ton skips. All gates on the pocket are air operated. The tramming crew consists of three men per shift, one of whom acts as a skip tender and loads the ore for hoisting. These men work on a contract basis.

In the scraping method, now being replaced by the shaker method of moving ore, the practice was to move the ore by the use of 25 hp slusher hoists with 42-in. width scrapers, using a pull rope of ½ in. diam and a pull-back rope with ⅜ in. diam. The tail block is manufactured in the mine shops and the sheave wheel is removable. One man operates the slusher and uses a pavement breaker to break

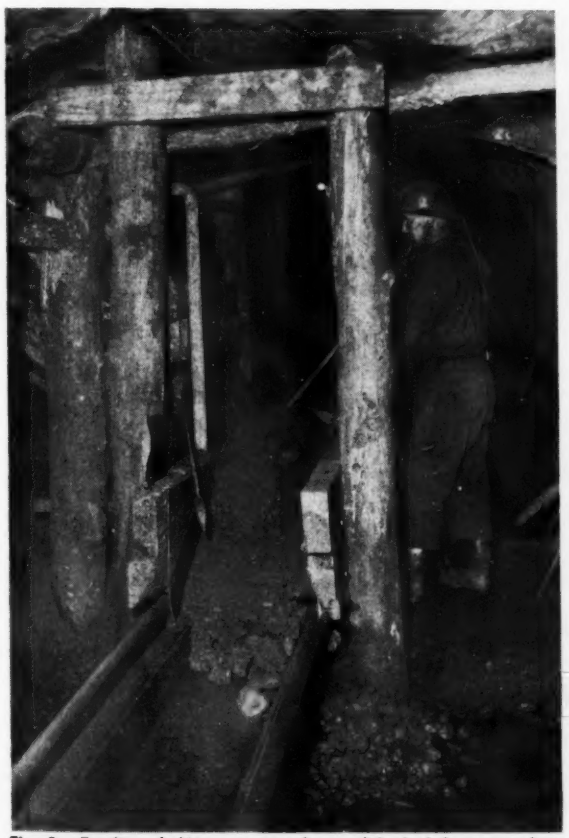


Fig. 2.—Feeding shaking conveyor from solid plank box-type chute

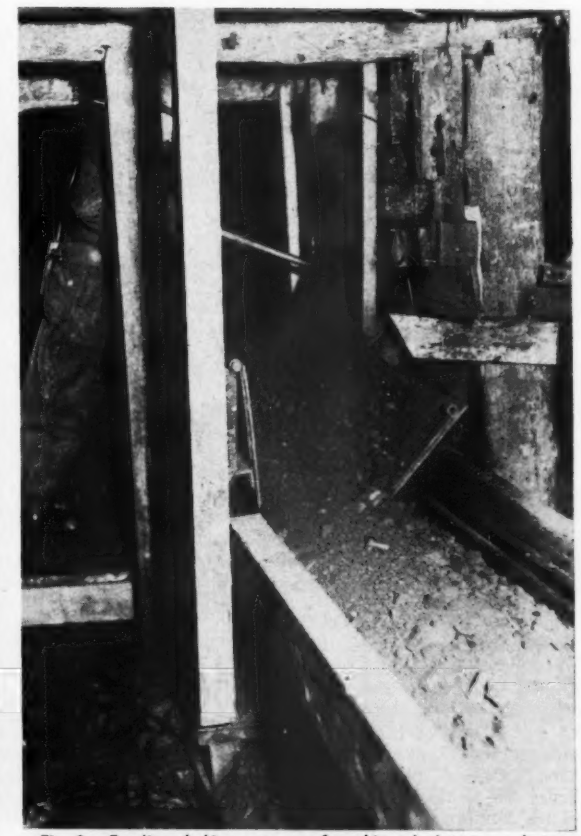


Fig. 3.—Feeding shaking conveyor from hinged plate-type chute

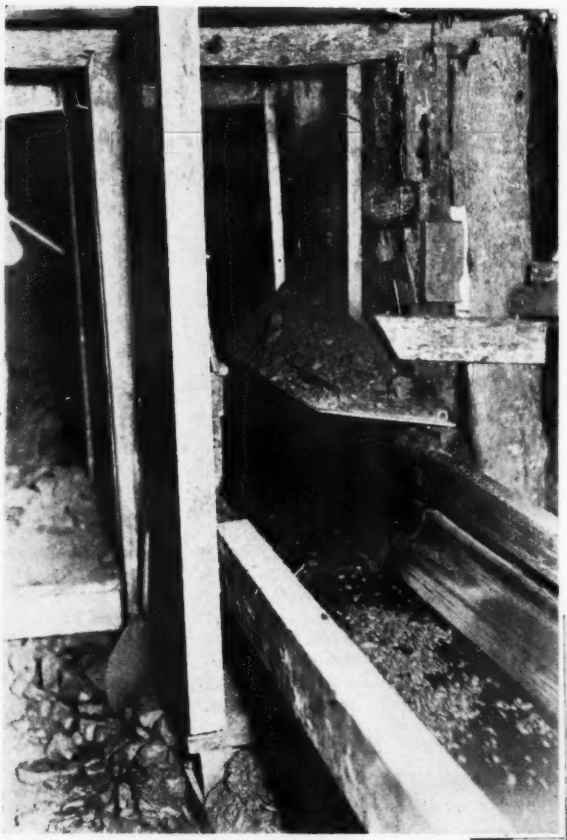
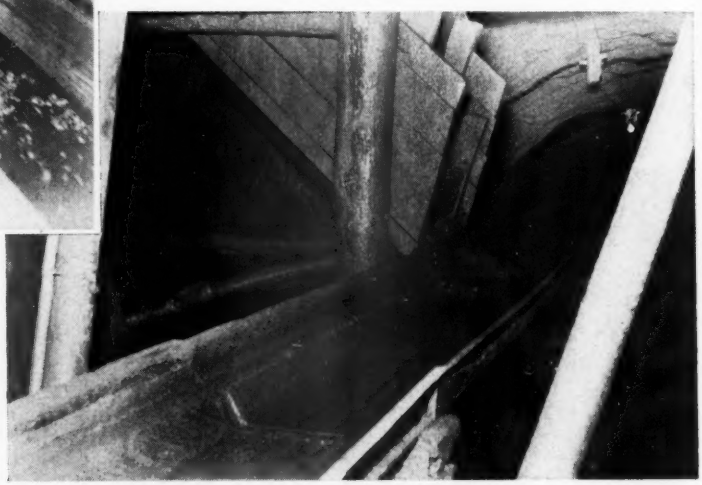


Fig. 4.—Hinged plate raised to permit passage of ore from inside loading points

Fig. 5 (below).—Well broken ore from development is loaded by a simple chute



chunks on a grizzly with bars spaced approximately 9 in. apart.

Referring to the stope above the floor pillar shown in Fig. 1, we can see that as the stope is mined towards the ladder road, the scraping distance becomes less and less as new mill raises are uncovered on the bottom of the stope; hence, the scraping operation becomes more efficient as the mining continues because less time for the scraper to be pulled back is required, and because better visibility is afforded for the scraper operator.

Experiment Developed Successful Shaker Practice

Early in 1943 the first shaker chute was installed in the Sherwood Mine. Since this time, experiments have continued in an attempt to improve methods of loading, unloading, and maintaining this particular type of equipment.

Some of the experiments tried with varying degrees of success in loading the shaker conveyor were to allow the material to drop from a mill raise on to a platform of planks, and then to remove the planks to allow the material to load into the shaker pans. Later the method used was to build a chute similar to the one shown in Fig. 2, where solid plank side boards are used as a pocket to hold the material as it drops from the raise and to feed it on to the shaker pan. The method used today, and considered the most satisfactory, uses hinged plates supported above the shaker pan to guide the material from the mill raise into the trough of the shaker pan.

In using this present method of loading the shaker conveyor, it is hoped that excessive shaker-pan wear caused by the friction between the metal loading chute and the metal shaker pans can be eliminated, and that accessibility to the pans for cleaning and replacement can be improved.

To follow the steps taken in the installing of the shaker conveyor on the 1200-ft level, where the main 36-in. belt is also installed, assume that the shaker transfer drift has been driven and the mill raises completed. The first step taken is the leveling of the transfer drift to grade, using elevations given by the engineer. The next step is to moil and blast the subgrade where the shaker unit itself is to be located. The concrete base is then poured and the shaker unit installed and leveled on this concrete. Two 3-in. planks are used between the shaker unit and the concrete base to act as a cushion and to prevent any unevenness of the concrete from causing cracking of the shaker unit base. Next, the pans are installed and the shaker unit jacked down on the four corners with the jacks reaching from the roof to the shaker unit. It is important that this shaker unit is a solid installation when the unit begins to run. The shaker pans are lined in place by the engineer both for line and elevation. Next the chute to feed the discharge from the pan line onto the conveyor belt is installed. At the same time as this discharge chute is being erected, work begins on the feeding chute that delivers the stope material to the shaker pan line.

The pans are standard 10-ft sections, with Hi-Steel liners welded in the trough. The pans are supported on Ray-type roller supports. The older type pans were bolted together with 1¼-in. bolts. Loosening of this bolted connection and failure of the bolts caused considerable maintenance work. The new model pans are connected together by U-shaped lugs. No breakage of lugs or pan lines have been found to date, although these new pans have been in use for approximately six months.

Experiments with different size pinion gears within the unit have shown that the output of the shaker is considerably greater with the faster stroke, but breakage of pan lines and gears is also increased. Experience has shown that pan lines over 200 ft in length result in slow and inefficient shaking and trouble due to pan and

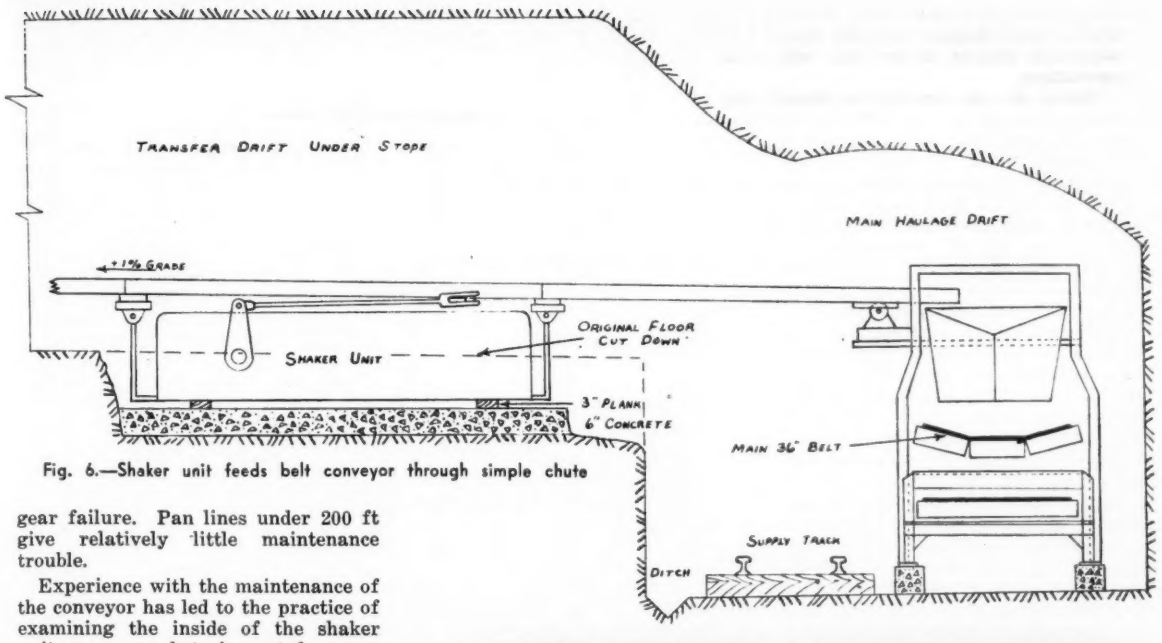


Fig. 6.—Shaker unit feeds belt conveyor through simple chute

gear failure. Pan lines under 200 ft give relatively little maintenance trouble.

Experience with the maintenance of the conveyor has led to the practice of examining the inside of the shaker unit once a week to inspect for worn gears and worn parts. Thus serious breakdowns with their consequent loss of production time can usually be avoided. A recent experiment was to install "saddles" on each pan support roller. The purpose of these saddles was to raise and lower the pan line as it moved backward and forward, the thought being that sticky and hard-to-shake dirt would thus be prevented from building up in the trough and causing spillage. This was not the case and no beneficial results were noted.

Table I below, lists tonnages of ore moved by shaker conveyor in 1943 when the first shaker was installed, through the present date:

TABLE I.

Year	Amount of ore moved, Tons (gross)
1943	59,000
1944	107,000
1945	92,000
1946	90,000
1947	167,000
1948 (through July 31)	165,000
Total through July 31, 1948	680,000
Belts through July 31, 1948	401,857

Belt Conveyor Installation

In October 1946, the first work on the installation of belts was begun when the No. 1 belt was erected. Some of the problems originally faced before beginning the installation were: handling the large reels of belting (weighing approximately 6 tons) in the confined spaces of the shaft and underground drifts; installing this

Fig. 7.—Shaker units are held by jacks

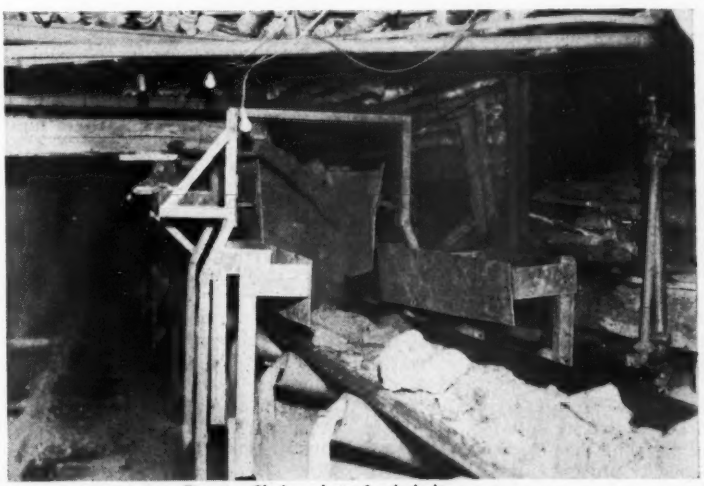


Fig. 8.—Shaker chute feeds belt conveyor

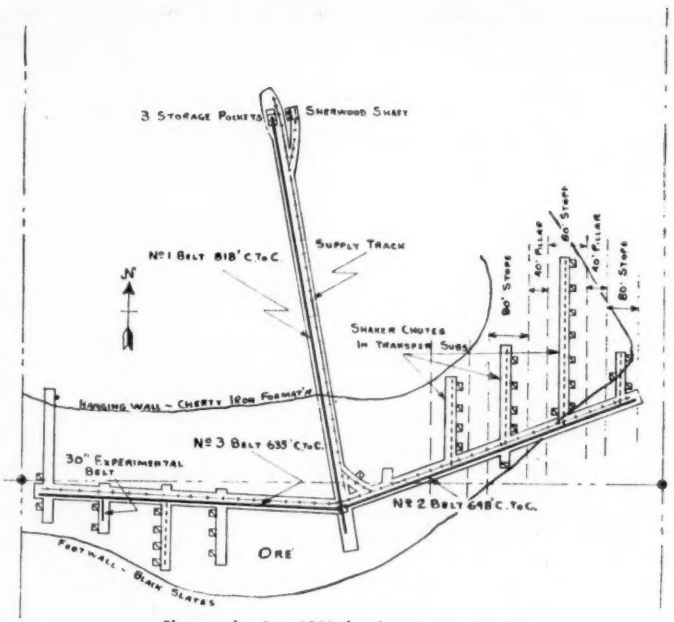
belting on the erected conveyor framework; and measuring the ore from separate stopes after the belt was operating.

When it was decided to install the belt conveyor on the 1200-ft level instead of locomotive and car method of haulage, it was expected that approximately 5,000,000 tons of ore would be moved over these belts to justify a capital expenditure of $90,000. This capital expenditure is roughly 50 per cent greater than would be required for a trolley-locomotive and tram car installation.

The main south crosscut and the drift to the east were driven by conventional methods using track haulage to convey the material from the breast to the shaft pocket. The track was moved to one side of the drift before the belt conveyors were erected. The drift to the west was driven by scraping material from the breast onto a belt conveyor. This was done by installing enough conveyor so that it would not be damaged by the blasting in the breast, and by scraping from the breast to this portion of the belt conveyor. When the scraping distance became too great, another portion of the belt conveyor was erected. By this practice the time involved to clear the breast of the cut of ore or rock was materially reduced.

All the belt conveyors were erected and put into operation by the miners and other underground personnel. Outside help was called in on vulcanizing the belt splices.

The characteristics of the completed belt installation are as follows:



Sherwood mine 1200 level. (1 in.=350 ft)

	Conveyor No. 1	Conveyor No. 2	Conveyor No. 3
Width of Belt, inches	36	36	36
Center to center end pulleys, feet	818	648	635
Capacity, tons per hour	250	250	250
Speed, feet per minute	200	200	200
A-C motors—horsepower	20	20	20
Lift, tail to head pulley, feet	2.1	4.8	5.5

The entire belt installation is electrically controlled so that if the No. 1 belt is not running, all equipment inside the mine behind this belt will be stopped. The problem of cleaning ore and water from the belt is being worked on continually. It is one that is usually peculiar to the particular material being handled. One method employed with some success is the use of a series of small blades diagonally echeloned across the belt to scrape the material from the belt.

Most of the damage to the belts to date has been done when the transfer drifts are first opened up. To do this work, rails are erected approximately 16 in. above the top of the belt and the material from the transfer drifts is scraped directly onto the belt. This loading point has been raised above the belt to prevent large pieces of ore lodging between it and the face of the belt, thus damaging the belt. In spite of the raising of the rails to a position 16 in. above the belt, pieces of ore and rock occasionally lodge between the rails and the belt and thus do damage. To reduce this hazard shaker conveyors are installed in the transfer drifts as soon as possible.

In order to tram supplies over the No. 1 belt in the main crosscut, a bridge has been erected. This bridge is a drawbridge and is capable of supporting a 6-ton locomotive. It is drawn up away from the belt when not in use. At the same location there is a walk-way constructed over the belt to allow personnel to travel into the west drift.

Shaker-Belt Operation Closely Controlled

Referring to Fig. 2, it can be seen that the broken ore from the stope drops through a chute onto the inside end of the shaker conveyor. The shaker conveys the ore to the main belt that carries the ore to the shaft, dumping into three storage pockets. The flow of material into any of these three pockets is controlled by manually-operated butterfly gates. These three storage pockets were designed to serve either a track-haulage or belt-conveyor system on the 1200-ft level. The pockets discharge into two measuring pockets which in turn load the two 6-ton skips.

Normal operation of the belt conveyors require two men. One man at the shaft end of the No. 1 belt controls the butterfly gates so as to direct the material into an empty pocket, and the other man is stationed at the intersection of the three belts. This latter man keeps a close watch on the operation of all three belts and also records the time that the shaker unit in each contract is loading the main belt. In addition to the two men when the belt conveyors are in continuous operation, a skiptender loads the material from the pocket into the skips.

The periods of time during which each separate shaker unit is operating are used as a basis for computing the tonnage of material coming from each stope. A time-tonnage factor is determined for each shaker chute by operating that unit alone and observing the number of skips of material moved in a certain period of time. After this factor is once established as many as four shaker chutes (four shakers load the main belt to capacity) may be operating simultaneously and the output of each can be estimated by the shaker time-tonnage factor.

In order that the belt tender at the intersection of the three belts may know when certain shaker chutes are operating, a system of signal lights has been installed. A bank of indicating lamps at the belt intersection and at the pocket indicate which shakers are in operation. These lights are manually controlled by the shaker-

(Continued on page 61)

Safe Timber Recovery in Coal Mining

In Pillar Extraction, Timber Removal Is Necessary to Cause Roof Falls and Relieve the Overlying Weight; This Article Describes How Study and Research Have Eliminated the Hazards from This Operation.

By GEORGE H. SAMBROOK
Safety Director
H. C. Frick Coke Co. and
United States Coal and Coke Co.

IN most phases of coal mining, such as roof protection at the working face, blasting and transportation, there has been continual progress in making these operations less hazardous. Timber recovery, however, lagged behind in developing safe practices until recent years when new methods have made it comparable to other near accident-proof occupations. The remarkable thing about this transition is that making roof falls had always been regarded as one of the most hazardous tasks in coal mining; certainly the number of serious and fatal accidents resulting from it should leave no doubt that it presented a great opportunity for safety improvement. Removing mine timbers, in itself, is a paradox and there is grim irony in the fact that its sole purpose is to induce a collapse of the overlying strata. This is directly opposed to the principle of preventing and providing protection against roof falls.

A mining plan designed for a high percentage of coal extraction is based upon an analysis showing that the removal of roof supports from worked-out areas is necessary for various reasons, and many benefits are derived from this practice. Systematic caving of the overlying strata promotes the free breaking of the mine roof and, in turn, retards the projection of weight on pillars in advance of the fracture line. This tends to stabilize the surrounding area and increases both safety and coal recovery. The free breaking and regular caving of the roof results in a more uniform discharge of gas from the overlying rock. This aids ventilation in keeping the gob areas free of explosive mixtures. In addition to these advantages, the monetary saving in the recovery of material for re-use is an important factor. The evolution of the present plan of making roof falls passed through six major phases, starting from an original method which had few safety features and reaching today a system that includes most of the benefits of safety.

The first method was the dislodging of crossbars and posts with hand tools, such as an ax or sledge, with no attempt to salvage the timbers. This may be examined from any angle and found almost entirely lacking in safety features. Men were constantly in the danger area while the work was in progress, and for a great many years a fatalistic attitude was held by workmen and officials alike that accidents were the inescapable heritage of mine roof control. Safe rules of procedure were difficult to formulate and the entire operation was dependent largely on the individual employed. During that early period, the primary thought of those engaged in making roof breaks was to complete the task as quickly as possible, a fact that offered little hope of applying safeguards. The one circumstance that prevented greater loss of life was that the wing and pocket system of mining then in vogue exposed a fall area of only approximately 300 sq ft, compared to the much larger areas exposed in the present mining system. This method was in general use until the early nineteen-twenties when one forward step was made; the manually-operated post puller was adopted which lessened the hazard somewhat but did not furnish the complete answer to the problem. About this time the plan of mining changed to what is known as the open-end system. The open ends or cut-overs were 65 ft long and 22 ft wide which made a fall area of 1438 sq ft requiring a minimum timbering of 14 crossbars, 15 straight posts, and three cribs. This same open-end system of mining prevails today.

Extract of paper presented to National Safety Council, Chicago, October 19, 1948.

Post Puller Supplanted Hand Methods

Manually-operated post pullers, consisting of a chain, a ratchet bar, and a vertical lever are a simple apparatus. One end of the chain was hooked to the roof support to be drawn, the other end to the ratchet; the chain was pulled by operating the lever, causing the crossbar to be dislodged. A post was set to anchor the ratchet in place. One pull did not always dislodge the roof support, in which case it was necessary to loosen the chain, move the ratchet forward on the bar, and again make a pull. The cribs and crossbars were extracted singly in sequence, starting at the inby end of the fall area.

One of the primary safety features of this method was that it reduced the time of exposure in the roof-fall area for workmen, but the disadvantages were almost too many to enumerate. For example, post pullers were hard to operate and numerous injuries resulted from mechanical failures. Men were continually exposed to the hazard of slate falls since it was necessary to set up and operate the pulling device in the danger area because it could not be used on curves. They could not pull heavy loads. There was a constant temptation to use the hand tool method of dislodging crossbars and posts when these could not readily be extracted with a post puller, and often there was a subsidence of top after pulling a crossbar which caused the roof to settle on the other timbers; also, there was danger that a man might pass the last crossbar to recover a timber that had fallen in the unsupported area. There were other disadvantages, but these few will show the difficulties encountered in attempting to make progress.

Although the time of exposure for workmen was substantially reduced by the post puller, efforts in making improvements did not stop. Not only was it necessary to increase the safety factor, but the advent of mechanical mining, coupled with high-speed production, made it imperative that the efficiency of the operation be considered. With these requirements in mind, management diligently set about finding the answers to at least some of the problems, and presently devised a method wherein a locomotive and a ¾-in. steel cable were introduced to supplant the manual post puller as a means of improving safety and efficiency. At this time, as a further safeguard, it was decided to sacrifice posts and timber legs and recover only the crossbars and cribs; these were extracted in sequence, starting from the inby end of the cut-over in the same manner as previously followed.

Use of Locomotive Decreased Hazards

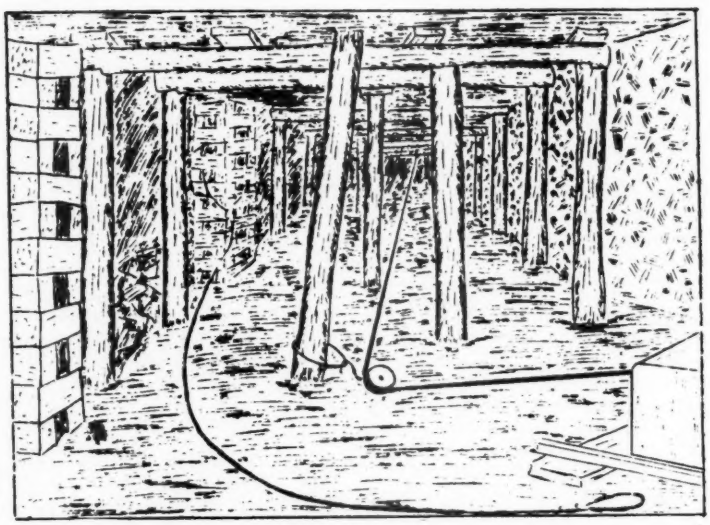
Application of the locomotive method represented a great forward step by reason of its many safety features, or rather, because it eliminated quite a few of the disadvantages of the manual post puller. The exposure time of men in the fall area was decreased; injuries no longer resulted from the operation of the post puller; heavy loads could be pulled because of greater mechanical efficiency; and pulls could be made on curves by means of a snatch block for a rope guide. The temptation to use hand tools was completely eliminated, and it was no longer necessary to position equipment in the fall area to extract roof supports. Despite the fact that this was a step forward in the direction of safety and efficiency, the main objectionable feature remained. The exposure of workmen in the mined-out areas without adequate protection was still much too long because of the time involved while attaching the cable and recovering dislodged timbers.

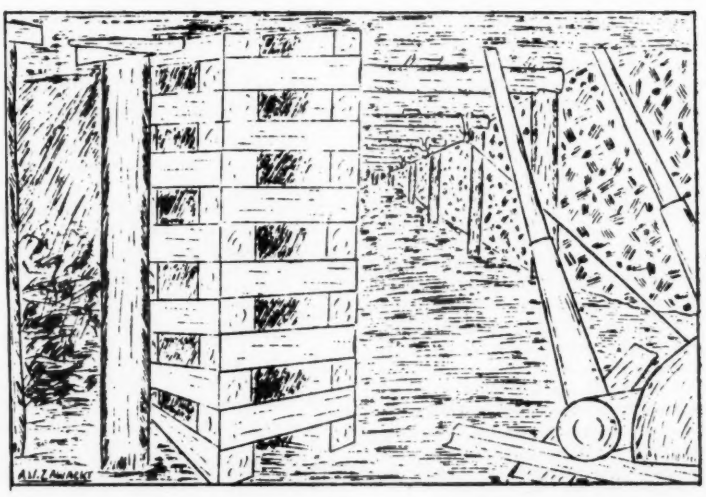
This hazardous feature gave rise to a fourth method: making use of a locomotive and two ¾-in. steel cables. The only difference between this method and the preceding one was that two cables were used instead of one, but it was an improved factor for safety. In practice, the master rope was attached to the first crossbar to be extracted before using the auxiliary rope to dislodge the first crib. After the first crib was removed and the blocks recovered, the auxiliary rope was attached to the next crib, as shown in Fig. 1 and the master rope extracted the inby crossbars. The second crib was then removed and the sequence continued until the roof break was completed. This procedure left crossbars in place while the crib blocks were removed, and, since a cable previously had been attached to the next crossbar to be recovered, not only was protection afforded the workmen recovering the crib blocks, but the crossbar would be extracted safely. Attention is again called to the ultimate objective of these methods of timber removal; namely, to reduce the time of exposure for workmen in the fall area without adequate protection.

Study Developed New Method

This method represented a forward step for safety, but department heads were not satisfied, and a committee was appointed to make a detailed study and thorough analysis of roof control practices and to devise an even better method. One of the first steps taken by this committee was to inquire into the advantages of a self-propelled, timber-removal machine. Pending the adoption of this power-driven post puller, extensive research in the field was effected by various officials of the company. This search for improvement revealed the fact that in all previous methods of making roof falls by extracting supports singly and in sequence, too much stress had been laid on the recovery of posts and supporting legs of crossbars, which not only had proved to be extremely hazardous, but in many cases resulted in the more valuable and re-usable crossbars and cribblocks being covered by falls. When crossbars and cribs were extracted singly and in sequence, the roof strata immediately above the coal seam, being friable and laminated, was disturbed by the continual rock movements during the time involved in the sequence of extraction; as a result, frequent falls of coal, draw slate, and rock made a hazardous task of attaching the rope to the roof support to be dislodged. In addition, these breaks often overrode standing crossbars and cribs, covering them and making their recovery impossible.

To effect the degree of safety desired, it was necessary to abandon the recovery of all single posts and supporting legs of crossbars, and to devise a method whereby all crossbars were extracted and removed from the fall area in a single pull. Despite the increased complexities that accompanied numerous experiments, a plan finally was advanced which already has achieved results that far surpass those of previous performances. This advanced step toward safety as used with the electrically operated post puller is illustrated in Fig. 2. On the front end of a locomotive are placed two hydraulic jacks which are forced against the roof at an angle of about 60 deg to anchor the machine while a pull is being made. Between these





Figs. 1 and 2.—Locomotive replaces hand-operated post puller

jacks is a drum with a steel cable. The machine is self-propelled with power for tramming and pulling supplied by a trailing cable attached to the trolley wire. The first step in making a fall is to loop steel rope slings, each approximately 4 ft in diameter, over each crossbar to be pulled. The next step is to pull each crib singly, beginning at the inby end of the cut-over. After the cribs have been extracted, the slings are threaded with the master rope and the crossbars extracted in a single operation.

Exposure to Roof Falls Reduced

This latter accomplishment represented an advance along the line of safety and reduced considerably the time workmen spent in the fall area. An objectionable feature of the machine was that it operated a single rope from the drum, a fact which made it necessary for workmen to traverse the entire length of the fall area, after the cribs had been recovered, in order to reeve the slings. Heads of various departments then planned an improved method, shown in Figs. 3 and 4, that offered a solution to the problem. This system is called the sling rope method, and, briefly stated, the following steps are taken in making a fall:

(1) Preparation for making falls, including the setting of center posts if necessary, the removal of track, ties, etc., is done immediately upon completion of coal loading operations in all places where the roof is to be caved. This supplies the opportunity needed for more careful and accurate supervision by foremen responsible for the operations, creates the greatest degree of safety for the crews, and provides the best possible conditions for maximum timber recovery.

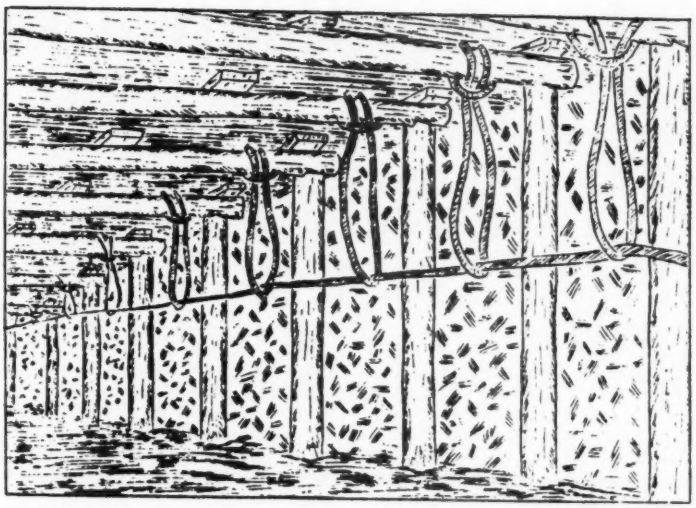
(2) Steel rope slings, approximately 4 ft in diameter, are looped over those crossbars which, in the judgment of the section foreman, can be safely recovered. These slings are attached to the rib side of the crossbars.

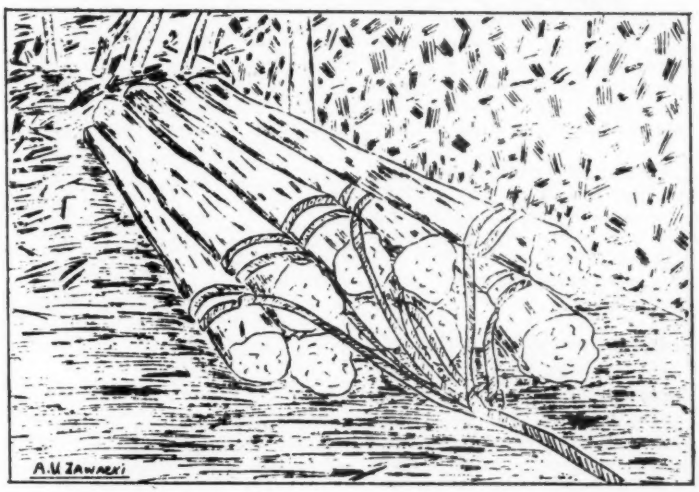
(3) The slings are then threaded with the master rope, starting from the curve to the inby timber to be recovered.

(4) Cribs are then extracted by the use of a locomotive, and an auxiliary steel cable, beginning at the inby end and removing the cribs singly.

(5) The master rope, which already is strung through the loops on the crossbars, is then attached to the locomotive and the crossbars are extracted in a single operation.

All of the crossbars are in place while the cribs are being extracted, but the master cable and slings are on the crossbars before any of the roof supports are pulled. Thus, after the cribs are taken out, it is no longer necessary to go back into the fall area to hook onto the timbers, and





Figs. 3 and 4.—Present method of pulling and recovering crossbars

the exposure time of the workmen in that area while recovering timbers is completely eliminated. This method presents that much sought after goal: minimizing exposure time of workmen to roof falls.

In recent years, many diverse opinions arose from the complexities of timber recovery and making roof falls, but nothing is more eloquent than bare facts in proving progress. From an analysis over the past ten years, the following was disclosed: The current system of timber recovery shows a decrease of 70 percent in all serious accidents over previous mechanical methods. In addition, there have been no fatal accidents to date, a decrease in that class of 100 percent. The number of man hours required to complete a roof fall has been reduced 50 percent, an important factor in maintaining a continuous cycle of operations with a minimum loss of time, which is so vital in mechanical mining. The recovery of material for re-use is comparable to all previous methods, but, to repeat, the outstanding advantage is that it has practically eliminated the exposure of workmen to a roof area that has been subjected to an intensive rock movement.

Since its inception, the current procedure of timber removal has proved to be a worthy safety project, and its continual use and adoption can be justified by the results obtained through the reduction of accidents during roof fall operations.

Foresight and persistent effort demonstrated that safety in timber recovery is not a mere fallacy as it was once thought to be. Safety is available to those who make an earnest effort in search of it. By continuing the same unrelenting and diligent approach to all problems, it is to be hoped that the mining of coal will some day attain its prime objective and become an accident-free industry.

Automatic Control In Milling

Approach to Trouble-free Metallurgy Possible With Application of Controlling Devices

By I. MILTON LeBARON
Supervisor of Phosphate Research
Research Division
International Minerals & Chemical Corp.

LACK of uniformity is without question the most difficult problem that faces mill men in plant operation. Feeds are not uniform in grindability nor chemical analysis, and the products of process stages throughout the plant, which may be feeds for some other operation, vary in tonnage per unit time, chemical analysis, and screen analysis.

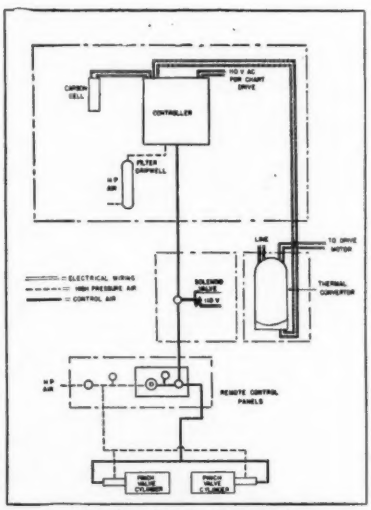
Given a uniform quality feed, then control of the rate of feed for the ore, water, and reagents at various points at a constant optimum value results in a continuously trouble-free metallurgical operation. Only the mechanical maintenance will then produce difficulties.

It is theoretically possible to design a plant that comes close to meeting such requirements. However, from a practical viewpoint, only those items which the economics of operation can justify should be placed under automatic controls.

Blending Provides Uniform Feed

In most projects it has been found desirable to watch mining operations carefully and to blend in order to maintain a reasonably uniform type and analysis of feed. One of the outstanding examples of blending to uniform analysis is carried out at the plant of Tennessee Coal & Iron Co. where 10,000 to 20,000 tons a day of iron ore are blended from bins of determined analysis to produce uniform blast furnace feed. Several milling plants under design today are using this type of blending to give a uniform feed to the mill. However even under good blending conditions there will be differences in screen analysis and grindability.

In a conventional milling plant the first point of application of control to maximum tonnage will be found in the secondary crushing. Control here is usually effected by fixing the load on the crusher drive motor at maximum point and regulating the feed rate to hold this load constant. This can be done by several methods. The power used by the crusher motor can directly energize the electronic circuit. The feed rate is increased or decreased depending upon the power consumed by the crusher motor. Utah Copper has an installation of this type. The power may also activate a thermal converter and a d-c controller may be adapted to the circuit. There are several modifications of this type of control in operations throughout the country.

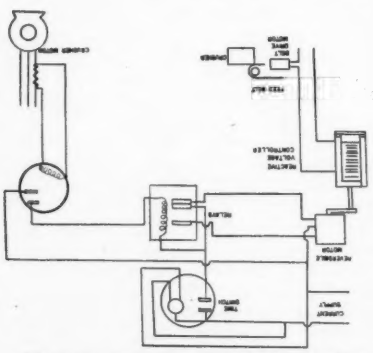


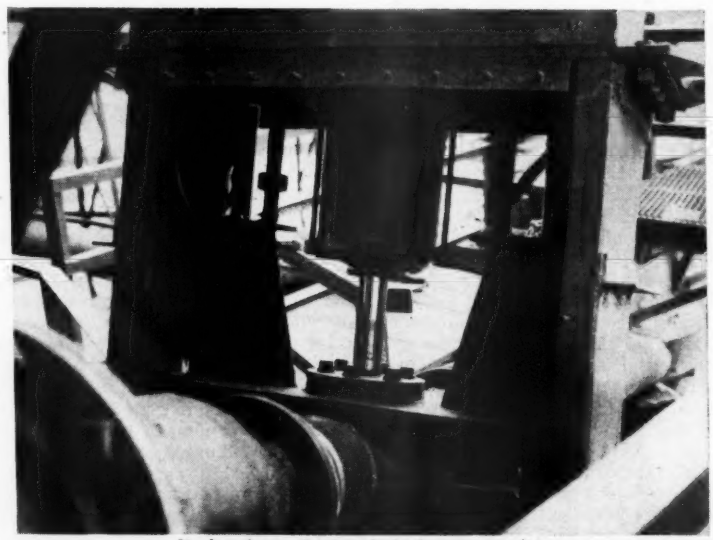
Pinch valve feed control

Dry and Wet Feed Controls

Feed controls for crusher products or dry materials in general have been worked out to the point where it is only necessary to purchase such equipment from any one of a number of manufacturers. However the feeding of wet pulps at constant rates is still in the development stage. The circuit must have the following essentials:

(1) A valve, gate, or feeder that can mechanically regulate the rate of flow


Crusher power use controls feed rate


Pinch valve maintains desired percent solids

(2) A device that indicates the tonnage rate

(3) A controller that receives the information from the indicator and regulates the valve

When the pulp is to be dewatered and fed onto a belt by a classifier, the tonnage indicator may be a Weightometer or the power load on the classifier that carries out the dewatering. The latter is to be preferred since the time lag is less between indication and effect on the valve. A thermal converter translates the motor load to a controller. The controller then operates the air pinch valve.

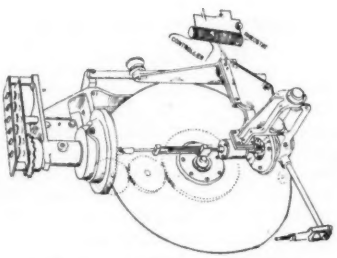
Standard recording Weightometers may be adapted to a controlling unit. A number of types of rheostats can be used with such a control; but on wet pulps there may be as much as five minutes' lag from pinch valve operation to Weightometer reaction. This makes control through classifier loading preferable.

Increased efficiency in milling operations and a reduction in personnel can be effected by improving the uniformity of procedures through the application of various mechanical, electrical, and thermal devices. Crusher controls, load indicators, density controls, and other types are described here by a man who has had notable success in their practical application in treating Florida phosphate rock.

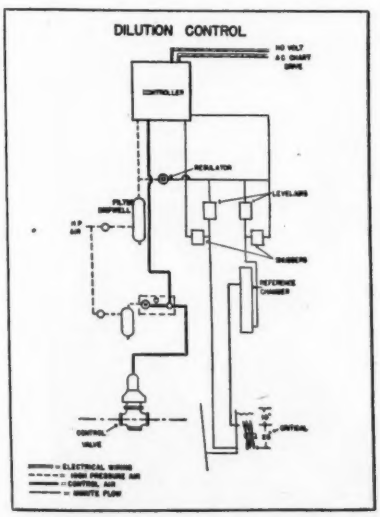
Thermal Convertor as Ball Mill Control

Control grinding circuits are under considerable development at present. One of the typical controls for optimum ball mill grinding is installed at the Castle Dome mill. Here the tonnage of feed to the ball mill is kept constant. As the circulating load on the mill changes, a thermal converter on the classifier drive operates the feeder for new feed, whether slowing it down or speeding it up as necessary. The screen analysis of the classifier overflow is held constant by means of an overflow density control.

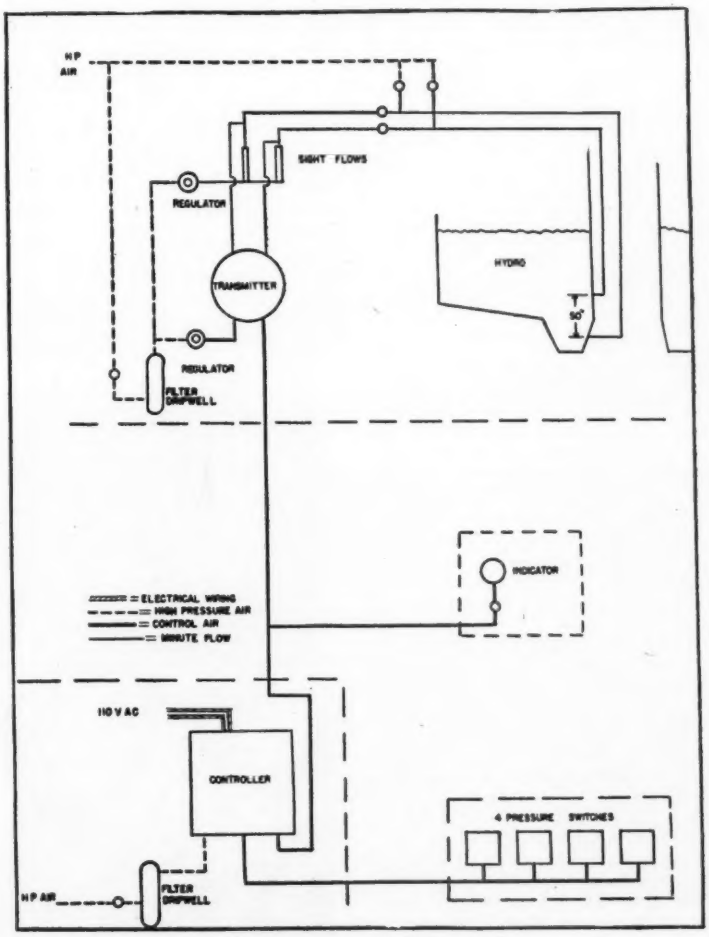
A variation of this circuit is one in which the power on the mill drive motor is maintained constant through control of rate of new feed. Mill controls of this sort have indicated 10 to



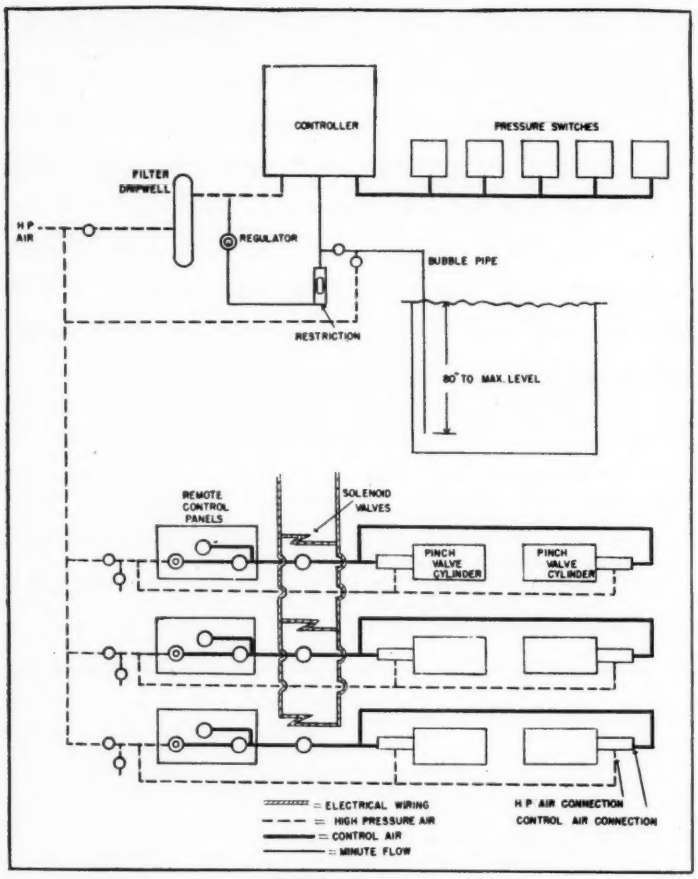
Feed control from weightometer



Bubble-tube differential controls valve



Hydroseparator underflow control



Sump-level control

15 per cent increase in grinding capacity.

Density Controls

Operation of a dilution control set-up using air back pressure in a bubble tube depends upon the effect of density of pulp on the pressure necessary to bubble a fixed amount of air through a column of constant height.

This type of control has several modifications. The one indicated has a double tube with a 25-in. head differential. As the difference in pneumatic head in the two bubble tubes increases, the water dilution valve will open to compensate.

In many operations the control of the percent solids in hydroseparator or thickener underflows is important. The density is actually controlled by the speed of the underflow pump. The speed of this pump is regulated by a pneumatic regulator that receives its intelligence from bubble-tube back pressure. A differential bubble tube is placed at the discharge of the hydroseparator or thickener and the per cent solids in the discharge measured.

A variation of this circuit is the control of the speed of the underflow pump by the electrical load on the motor driving the rake mechanism of the equipment. As the load on the rake arms increases, the per cent solids in the underflow will also rise. Calibration of such a circuit is, of course, necessary and it can be made to control fairly well.

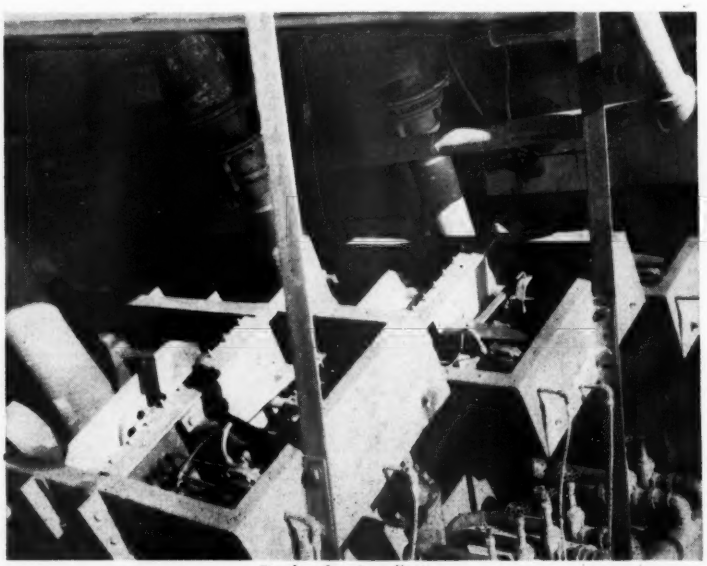
In the case of a spigot-discharge type of installation, a controlled pinch valve can be used to maintain the per cent solids desired.

Some plants have sumps taking variable discharges from several points which require a liquid level control in the sump. Several types of controls are in use. The two most common are electrical contactors and air bubble tubes. In the contactor type of installation, a float switch or conductivity type relay is used to speed up or slow down the sump pump. With the air tube, the back pressure of air in a single bubble tube actuates a controller which in turn operates a contactor panel. In this case three lines discharge into the sump. Solenoid operated valves work pinch valves which automatically close off the feed to the sump in case of power failure at the sump pump.

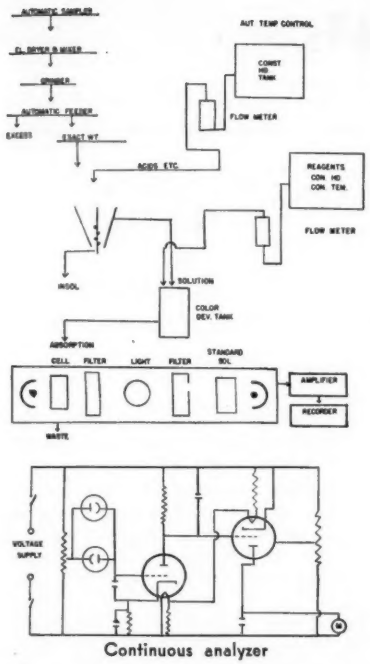
There are a large number of density control mechanisms used to regulate feeds to flotation cells, classifier overflows, and the like. Most of them depend upon indirect measurement of density, and the most nearly trouble-free type is the air bubble tube. There are several modifications of this now manufactured by reputable concerns.

Conductivity Regulates Reagent Use

Control of reagents is one of the most obvious of the mill man's difficulties. Only a few mills add reagents under automatically controlled conditions. An ingenious method has been developed at Tennessee Copper for xanthate control through use of the conductivity of the solution.



Pinch-valve installation



Continuous analyzer

Controls for pH regulation are standard equipment today. Difficulty in keeping electrodes functioning properly in pulps hinders the more widespread use of such controls. Continuous filtration of the feed to the measuring electrodes will eliminate most difficulties. Regulating of reagent by a recording pH controller is a simple operation.

Regulation of reagents through continuous surface-tension measurements on the pulp is one of the developments being considered at the present time. Future research will no doubt make this a useful tool.

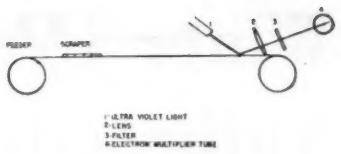
Color and Fluorescence

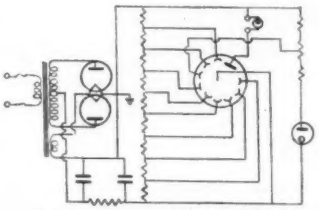
Most operators regulate their reagents by the analysis of their products. This is a stimulating development and makes use of continuous controlling analyzers. In the copper field where solution of tails and comparison of the depth of blue color has been a standard method of control, the adaptation of continuous colorimetric recording and controlling analysis is relatively easy. Its operation depends for its accuracy on the exact sampling and feeding of small quantities. A small sample is continuously dissolved and the color so developed continuously measured and recorded. Calibration of such an instrument is relatively easy. Operation of reagent controls from analysis is a logical supplementary development.

Another type of analyzer depends upon the fluorescent character of the material. Zircon and sphalerite can both be determined in this fashion. The dried material is spread on a belt. It then passes under the analyzer, which consists of an ultraviolet light source and a receiving photoelectric cell. As purity of the product increases, the intensity of fluorescence increases. Because of the low intensity of the reflection, an electron multiplier tube is used. Control from continuous recorded data can be effected without much difficulty.

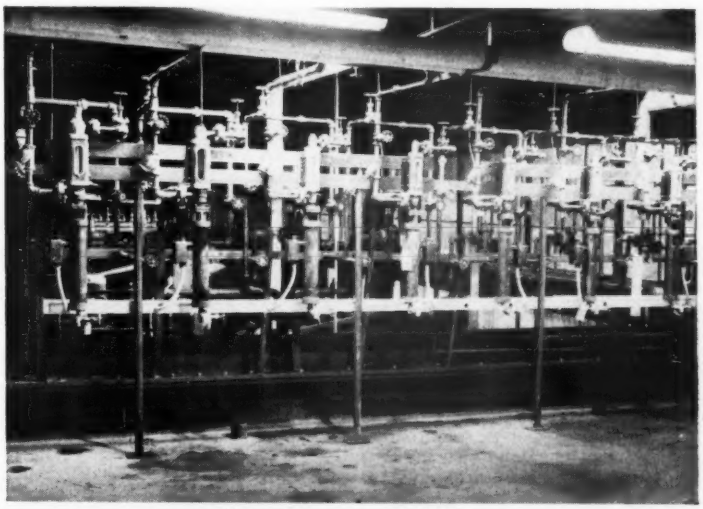
In operations using fairly large quantities of liquid reagents, the use of recording and controlling rotameters as feeders will increase efficiency. A record of the amounts of reagents used and a record of all changes in reagent set-up and the time of change constitute valuable checks.

With use of remote controls and automatic recording and controlling equipment, a plant can be largely operated from one point. An operator at the central control point has information from the entire operation. He can then use this information in operating the plant although the control and recording instruments may be operating units a quarter of a mile away.

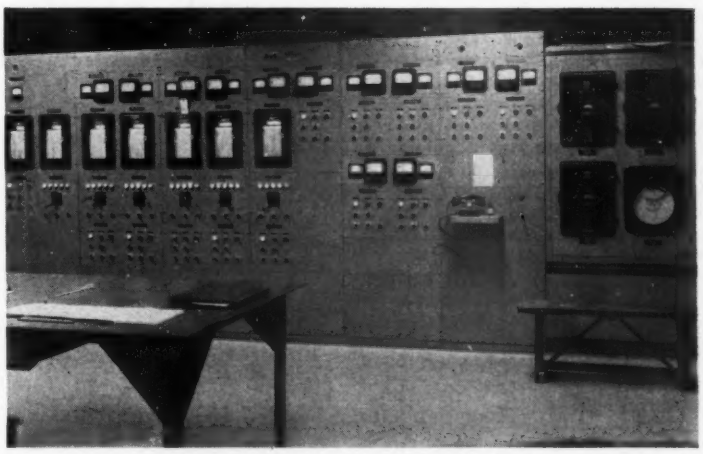




Continuous analyzer for fluorescent material



Rotameters measure fluid flow



Part of central control panel at Noralyn

Water Problems of the Anthracite Region

Steadily Increasing Amounts of Water Handled in Anthracite Mining Threaten Life of Industry.

H. H. OTTO,
J. T. GRIFFITHS,
and
W. E. THOMPSON
The Hudson Coal Co., Scranton, Pa.

IN the northeastern part of Pennsylvania, anthracite is mined in eight counties. For identification, the anthracite region is divided into four major fields: Northern, Eastern Middle, Western Middle, and Southern. The region covers a total of approximately 484 sq miles of coal area. The coal is deposited in long canoe-shaped basins, with generally steeply sloping sides, and containing many superimposed seams of varying thickness, continuity, and pitch.

With the passing years the water problem in the anthracite regon has increased to such proportions that it is the chief factor that threatens to cut short the ultimate life of the industry, and pending the end, to curtail present production. The structure of the coal measures facilitates the accumulation of water in the strata and mine workings. The mountains surrounding the anthracite fields are steep and the coal beds dip from the sides of the hills to beneath the valleys below. The effects of rainfall often overtaxes the pumping plants and floods part of active mines causing loss of production. During the years the annual precipitation has not varied too much, but the quantity of water entering the mines has increased tremendously. This has been caused by the ever-increasing area of broken ground as the result of the extraction of pillars, cave-ins, and stripping operations.

In addition to the increase in mine drainage caused by the breaking down of the overlying rock strata as a result of pillar removal, the problem was seriously augmented beginning about 1932 by the exhaustion or abandonment of mine properties whose drainage load was imposed upon the neighbors who continued in operation.

This increase in the water problem in late years is best illustrated by the ratio of tons of water pumped to the tons of coal produced underground for one of the major companies in the Northern Field:

TABLE I

Year	Ratio Tons of Water Pumped to Surface to Tons Coal Produced
1920	8.4 to 1
1925	10.6 to 1
1930	11.4 to 1
1935	26.2 to 1
1940	32.7 to 1
1945	43.8 to 1

Although Table I represents the experience of only one company, the amount of water pumped at 73 anthracite collieries increased from 19.5 tons of water per ton of coal in 1927, to 21.8 in 1931, and 29.3 in 1935.

There is an ever-increasing ratio of tons of water pumped to the tonnage of coal produced in the Anthracite Region. As mining proceeds in the Tri-State zinc-lead area, the Park City district of Utah, and other mining districts, pumping costs grow. Described here are the problems of the anthracite producers for the interest of operators who have to contend with similar conditions.

Table II shows the total pools now in existence in the Anthracite Region, together with their water content:

TABLE II

Field	No. Pools	Total Gallons
Northern	26	16,022,000,000
Eastern Middle	31	4,161,000,000
Western Middle	58	38,292,000,000
Southern	31	32,469,000,000
Total		90,944,000,000

In the Anthracite Region during 1945, 250,000,000,000 gal of water was handled at a cost of $13,000,000; 200,000,000,000 gal of this water was pumped to the surface or to drainage tunnels at a cost of $12,000,000; and 50,000,000,000 gal was handled by water-level drainage tunnels, ditches, and flumes on the surface at a cost of $1,000,000. The pumping head through which this water was handled varies from about 300 to 1200 ft.

Records show that in the Susquehanna River basin, which comprises approximately 80 percent of the area of the Anthracite Field, the yearly precipitation has averaged 37.44 in., while in the Delaware River basin, comprising approximately 20 percent of the area of the Anthracite Field, the average annual precipitation has amounted to 47.60 in., with a maximum year of 61½ in. The average annual precipitation on the entire Anthracite Field has been estimated to be 326,000,000,000 gal.

Barrier Pillars Aid Drainage

Mining in the Anthracite Region has been in progress about 130 years. In the early days no thought was given to the establishment of barrier pillars. This seriously aggravates the drainage problem today. As mining progressed the need for barrier pillars was realized. They were established sometimes by common consent of the operators and, in many cases, by agreement between the colliery operators and the State Mine Inspectors. Every mine operator, in the early stages of mining, pumped his own water. But with the exhaustion of individual mines, pumping is abandoned and the mine gradually fills up. If the abandoned mine is interconnected with its neighbor, then the water will flow into the active operation and must be handled there. Only in a few instances in the Northern Field will

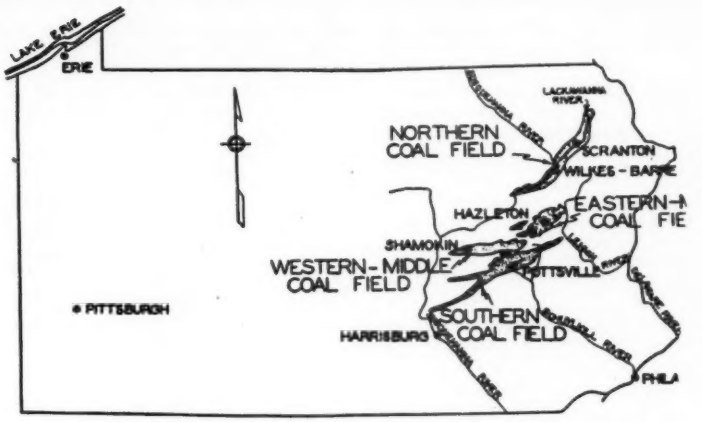
Presented by Cadwallader Evans, Jr., at meeting of West Virginia Coal Mining Institute, Beckley, W. Va., June 11, 1948.

the water flow by gravity from abandoned mines to the surface. In some instances the State Mine Inspector, even though there is in existence what appears to be a proper size barrier pillar, will insist on keeping the water head down so as to avoid creating pressures that they regard as dangerous. This necessitates drilling bore holes into the abandoned area from the active mine and keeping the head of water under control to a level satisfactory to the Inspector.

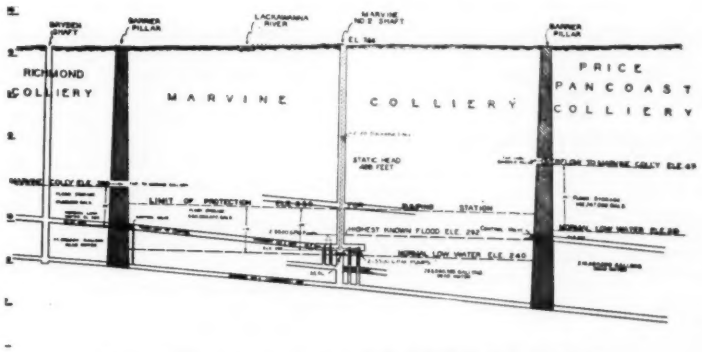
Problems Differ in the Various Fields

The Northern Anthracite Field lies in Lackawanna and Luzerne Counties. The upper portion, or Lackawanna County area, has the greatest depletion of coal reserves. The major portion of the remaining coal reserves are in the lowermost portion of the field, the Wilkes-Barre area. A serious situation exists with regard to the future of the Wilkes-Barre or Luzerne area. If the mine waters from the Lackawanna County collieries, amounting to 30,000 to 120,000 gpm, are not held back or controlled when the Lackawanna collieries are abandoned, they will overflow to the lower and deeper workings and present an almost insuperable obstacle to the safe and economical operation of the lower or Luzerne County portion of this field.

It is likely that this water will have to be pumped with many new pumping installations in the lower part of the Lackawanna Valley, with deep-well pumps of sufficient capacity to handle not only an average inflow of at least 60,000 gpm, but perhaps a peak of probably 120,000 gpm. This is a terrific problem and must be studied by authority wider than that of any one company, or even of all the remaining operating companies.



Pennsylvania's anthracite coal fields constitute a valuable resource

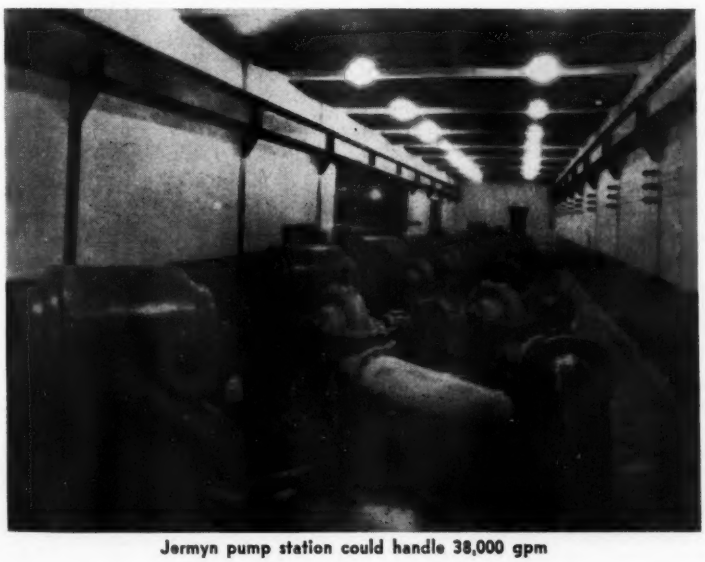


General pumping arrangements at Marvine Colliery to handle an average 17,800 gpm

The Eastern Middle Field contains the smallest amount of coal reserves of any of the fields and does not have an acute water problem due to the fact that, for the most part, drainage in this field is handled by drainage tunnels.

In the Western Middle Field, in 1927, 100 sq miles of coal area, or 85 percent of the field, was tributary to active collieries. Abandonment of operations since 1927 has reduced the active area to 50 sq miles, or approximately 40 percent of the entire field. The problem in this field is one of providing facilities that will minimize pumping loads during periods of high water, when existing facilities are sometimes unable to cope with the inflow of water from both active and inactive mines.

In the Southern Field, due to steep pitches and depth of workings, pumping is a costly item to add to other mining expenses. Rainfall quickly affects the workings in this field and often causes temporary cessation of operations with loss of production during high water periods. The largest reserves of anthracite lie in the Southern Field, where mining conditions are the most difficult. The future problem is one concerned with providing facilities that will permit dewatering and operation of abandoned collieries at minimum expense.



Jermyn pump station could handle 38,000 gpm

PARTIAL LIST OF PUMPING PLANTS, WITH PERTINENT DATA

	Northern		Western Middle		Southern
	Centrifugal	Deep-Well	Centrifugal	Deep-Well	Centrifugal
Number of plants	52	2	1	2	10 to surface 6 relays
Number of pumps involved	114	4	3	3	26 to surface 18 relays
Total capacity of plants gpm	318,555	16,000	20,400	15,000	61,400 to surface 28,995 relays
Investment per 1000 gal of capacity	$20,155	$22,000	$21,300	.....	$11,900†
Total Investment	$6,420,000	$350,800	$426,500	.....	$1,075,000†
Gallons pumped to surface annually	64,402,979,000	3,679,200,000*	4,764,000,000	3,913,947,000	6,801,759,800
Annual average gpm to surface	122,500	7,000*	9,064	7,446	12,941
Annual cost of operation	$2,394,000	$93,720*	.....	.....	$225,000
Net tons of water pumped annually	268,238,400	.....	20,000,000	.....	28,340,700
Net tons coal mined underground annually	12,871,028	‡	632,800	.....	2,975,166
Tons of water pumped per ton of coal mined underground	20.8	‡	32	48	9.5
Average cost per net ton	$0.186	‡	.....	.....	$0.0756

* Estimated.
† Exclusive of rock work.
‡ Pumps are operated on idle properties.
Note: First column of figures under "Northern" (Centrifugal) covers combined experience of two major companies in this field.

Estimated anthracite reserves, by fields, as of 1944, are as follows:

Field	Millions of Net Tons
Northern	2,553
Eastern Middle	99
Western Middle	3,561
Southern	9,572
Total	15,785*

* From "Anthracite Reserves: Commonwealth of Pennsylvania Topographic and Geologic Progress Report No. 130."

Pumping Problems Vary

Over virtually every coal basin in the Anthracite Region flows a river or a major creek, and all of them prove troublesome, to say the least. There are 750 miles of rivers and streams crossing the coal measures. Seepage from the wash underlying the stream beds is an important source of inflow, and occasionally breaks in the stream bed itself have caused the flooding of the mines.

In the Northern Anthracite coal fields the flatter coal measures allow for larger water storage in reserve underground sumps. In them sudden inflows of water during flash floods, or heavy inflows during prolonged periods of excessive precipitation, can be stored and pumped during dryer periods. Examples of reserve sumps inactive operations are: Eddy Creek Shaft, Clark Bed, Reserve Sump, where an 80,000,000 gal reserve sump has been constructed tributary to the Dunmore Bed pumping station. There is also in operation a reserve sump in Eddy Creek Shaft, Dunmore No. 4 Bed, of 39,000,000 gal, and an additional storage sump of 37,000,000 gal is in the making. Both sumps are tributary to the pumps located in this bed.

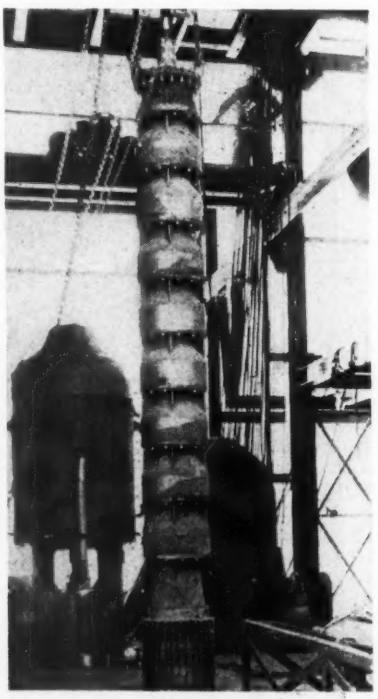
Where it is necessary to pump the water from an abandoned operation the controls, if possible, are so located that the abandoned mine becomes a reserve sump. The inflow to the active operation is regulated and the height of water in the abandoned mine controlled within limits considered safe to the active operation. Examples of abandoned mines so controlled, at Marvine Colliery, are:

Colliery	Gallons of Reserve Storage Above Control Points
Pancoast	142,747,000
Richmond	171,892,000

During July and August, the wettest months, there are frequently heavy rains for several days at a time, and occasionally a cloud-burst or flash-flood. One of the worst of these combinations occurred in 1922, when The Hudson Coal Co. lost its Jermyn pumping station. This led to the installation of a modern 38,000 gpm concealed pumping station at a cost of over $1,175,000, This installation, during its lifetime, successfully withstood the assault of flood waters many times. In May 1942, after a disastrous flash-flood, water was stored in the reserve sump immediately over the station to a vertical height of 125 ft. The reserve sump area held 355,000,000 gals of water at this peak. The duration of the flood period was 35 days and during that time 1,798,248,000 gals of water were discharged to the surface.

The Jermyn Mine has now been exhausted and the station abandoned. Fortunately there are adequate barrier pillars that isolate the basin and the water flows to daylight through a portal designed for that purpose. During the recent spring thaws as much as 67,000 gpm was measured as flowing from the mine. In previous years during similar wet periods, the sump would fill, and as the inflow decreased, the pumping plant would gradually reduce the quantity of water in the sump to normal.

Extending north of Scranton for about 6 miles, there is an area which serves as an outstanding example of the effect on the pumping load of The Hudson Coal Co., due to the exhaus-



Kingston No. 4 deep-well pump is typical of recent installations

tion and abandonment of independent collieries and their pumping plants. The underground drainage district embraced by this territory is about 15.4 sq miles, consisting of 8.9 sq miles of foreign operations, and 6.5 sq miles of The Hudson Coal Co.'s operations. The general surface elevation is 750 ft above sea level, and its deepest point is 20 ft below sea level.

The general pumping situation can best be illustrated by listing the installed pumping capacity in the basin during the period when all operations were in progress, as compared with present day installations. Listed below is the situation prior to 1932:

Colliery	No. of Plants	Rated gpm of Pumping Capacity to the Surface
Foreign Operations:		
Sterrick Creek	1	3,000
Mt. Jessup	1	5,200
Johnson	2	7,500
Lackawanna	2	17,300
Pancoast	2	6,000
Richmond	2	6,000
Legitts Creek	2	13,000
West Ridge	1	4,000
Sub-Total	13	62,000
Hudson Coal Operations:		
Olyphant	2	3,945
Eddy Creek	3	17,550
Marvine	1	4,450
Dickson-Manville	1	2,000
Sub-Total	7	27,945
GRAND TOTAL	20	89,945

Gradually coal exhaustion, economic exhaustion, or both, proceeded progressively from north to south, and over the past 15 years, all of the foreign collieries have been abandoned, with their pumping load becoming tributary to the remaining Hudson Coal Co. operations. The situation in this same territory, as of today, is as follows:

Colliery	No. of Plants	Rated gpm of Pumping Capacity to the Surface
Foreign Operations:		
None	-	All abandoned
Hudson Coal Operations:		
Olyphant	3	13,170
Eddy Creek	1	18,450
Marvine	1	22,000
Total	5	53,620

Comparison of the two tabulations will show that the presently installed pumping capacity of 53,620 gpm in this basin area replaces formerly installed capacity of 89,945 gpm. The Hudson Coal Co. capacity has increased from 27,945 gpm to 53,620 gpm. This total capacity takes care of all of the mine pumping to the surface in the 15.4 sq miles of area formerly handled by installed capacity of 89,945 gpm. During 1946 one of the foreign operations (Mt. Jessup) was re-opened. Installation of two 4000 gpm deep-well pumps has been made, relieving the Olyphant plant to some degree.

This total pumping capacity of 53,620 gpm is small compared with known inflows, and would be wholly inadequate if the inflow had to be dealt with currently. There are nine fully or partially-flooded properties within this drainage area. Five of these are now used as vast storage sumps, the water being controlled at suitable levels by means of valves on bore-holes through barrier pillars.

The pumps that handle this large volume of water are of the modern centrifugal type, electrically driven. They are usually installed in groups of two to four in concealed or semi-concealed pump rooms. The Marvine pumping plant is a typical example.

Marvine Pumping Plant and Pool

At Marvine Colliery a concealed pumping plant has a capacity of 22,000 gpm at normal sump elevation. This capacity is made up of four 5500 gpm centrifugal pumps, driven by four 1000 hp motors. In 1932, due to cessation of pumping by neighboring mines, the company was obliged to abandon the lower workings, seal off the shaft, and install two of the above mentioned pumps over the seal to handle the water. Subsequently, and again due to cessation of pumping and abandonment of mines by neighbors, two additional pumps of similar type and capacity were installed. Presently at this property, water is pumped not only from the company mine, but also from five abandoned mines as well. The pumping load at this property during 1945 was 17,843 gpm, based on continuous operation during 365 days, or 525,600 min per year. The static head through which the water was pumped varied from 452 to 504 ft. During this period the station successfully withstood a rise of the level in the sump of 41 ft vertically above the pump room floor. At this point the sump contained 225,500,000 gals of water. Below this active sump is an accumulation of dead water amounting to 763,000,000 gals.

Pumping problems in all of the fields follow the same general pattern. Sources of inflow are the same, except that these areas experience a heavier annual rainfall than does the Northern Field. However, in this field, owing to the steeply pitching beds and depth of workings, large underground storage areas and working sumps are not physically available. Pumping of sudden inflows, therefore, must be done immediately.

Pumping stations in the Southern Field are frequently placed in rooms excavated in the rock strata. Sumps of moderate size are also made in the rock. Large installations frequently have twin sumps, one or either side of the pumproom, and the suction is, in some cases, arranged so that half of the pumps take out of one side and half draw from the other side. In dry periods water is diverted to one sump while the other one is cleaned. Later the water is put into the second section of the sump and the first section is cleaned. In these cases the suction pipes are so arranged that they may suck water out of either sump. This arrangement is more complicated and a more expensive setup.

In the heavy pitch territory the mining progresses gradually down the pitch, which frequently results in main pumping plants becoming relay pumping stations, particularly when the head becomes too great. As an illustration: A mine pumping station may be located 500 ft below the surface. The shaft or slope is then sunk to lower levels and the water from these levels is relayed to the first station. At a later date, when the water becomes heavy on the lower levels, another and larger pumping station is installed to deliver the water to the first major pumping station in the shaft or slope. This may be done several times until the basin is reached. This eliminates the necessity of scrapping a pumping station, thus keeping down the total capital cost, but it does mean a slightly higher operating cost.

Drainage tunnels form an important link in dewatering of active or abandoned mine workings. They are applicable, however, only where coal basins lie, for the most part, above the natural drainage level of the surrounding surface. There are several drainage tunnel systems in the Anthracite Region, the larger number and more outstanding of these being located in the Eastern Middle Field. There are 22 such drainage tunnels, with a combined length of 138,000 ft, that handle water from active and abandoned mines. Of these, only two, having a total length of 14,960 ft, are in the Northern Field, and only one, which is 19,890 ft long, is in the Southern Field. There are four located in the Western Middle Field, with a combined length of 18,995 ft. The balance, 84,155 ft, are in the Eastern Middle Field.

The more prominent drainage tunnels in this field are the Jeddo, Beaver Meadow, Audenried, Green Mountain, Oneida, and Sandy Run. The Jeddo tunnel was constructed during 1891-1894. It has a series of connecting and auxiliary tunnels, the total length

of which aggregates 42,887 ft, which have been driven through the years as the necessity arose. The capacity of this tunnel is 150,000 gpm, and during one flood peak, the weir registered 139,100 gpm. The average minimum daily flow for an average month is 11,030 gpm and an average maximum flow for a similar period is 22,190 gpm.

Typical Pumping Plants

Beginning in 1920 large capacity, high-head, centrifugal pumps have been installed almost exclusively in all major pumping stations. This type of pump requires small space in pump rooms, has few running parts, therefore low maintenance costs, and has high efficiency. The pumps are made almost exclusively of bronze castings with bronze, chrome-iron, and chrome-nickel steel impellers to resist corrosion from the acid mine water. Units of 6000 gpm capacity each, with motors of 1000 hp are not uncommon.

The pumps are usually installed in groups of two or more, discharging into column lines that are located in shaft compartments, slopes, and boreholes. Column lines are usually constructed of cast-iron pipe, with or without lining of lead, wood, or transite. Automatic self-priming equipment is generally employed where required. Protective devices are usually installed on suction, pump, and discharge to guard against failures at each of these locations.

A recent development in mine pumping facilities is the adoption of the deep-well type pump for use on the surface or underground. Usually the same acid-resisting materials are employed as in the horizontal centrifugal pump. It has been found to be more economical and dependable to use deep-well installations in places where large and sudden inflows would jeopardize pumping stations at or below the drainage level. The following statement contains data of several operating companies in the Anthracite Region.

Mine Dams

The general purposes for which underground dams have been constructed in the anthracite region are:

(1) To prevent inflow of large quantities of surface or sub-surface water to open workings

(2) To confine drainage to exhausted or abandoned workings

(3) To create storage reserves to control flood inflows

(4) To build sumps for pumping stations

(5) To isolate mine workings to prevent spread of and to extinguish mine fires

Dams have been constructed throughout the region for all of the purposes mentioned above. They are usually constructed of plain or reinforced concrete, brick, or stone masonry. Temporary dams may also be constructed of wood. Shapes of the dams are usually flat or arched. Water heads imposed against these dams have ranged from a few feet to several hundred feet. In the heavy pitching territory, temporary dams or bulkheads are often installed in supports previously constructed to receive them.

A flash flood tilted this section of the 66-in. flume of Nottingham Colliery

Surface Preventative Measures

On the preventative side, in view of the high cost of pumping, huge sums are constantly being spent to keep surface drainage out of the mines. This work consists of constructing ditches and flumes of all types across broken ground, filling in cave holes, and patrolling the surface. Many large channels are constructed of various materials. Due to the topography, some are rubble-stone and concrete, but others are in the natural ground.

Wood and metal flumes are constructed to carry streams across spaces where future settlement may occur. These permit later regrading in the event of settlement and quick reestablishment of a break in the structure. Flumes range in size from 36 in. to 96 in. and are either box-shape, "V"-shape, or semi-circular.

As a result of the many complications arising out of water problems when adjoining mines of neighbors were abandoned, the Glen Alden, Lehigh Valley and Hudson Coal Cos. found that it would be to their mutual advantage to approach the problem jointly. As a result a number of such agreements were made between these companies.

Concrete flume intake for water diversion

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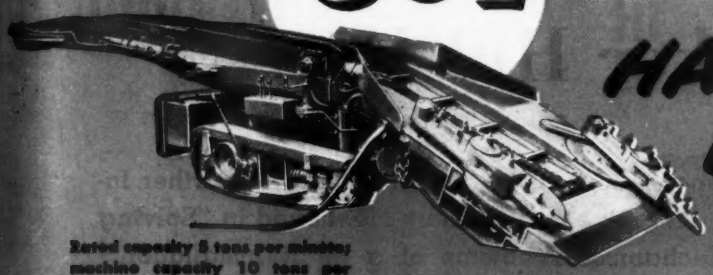

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Shaft Rollers Used in The Bunker Hill Mine

In Response to a Number of Requests for Further Information on the Shaft Rollers Mentioned in "Solving the Mechanical Problems of a Shaft Installation," "Mining Congress Journal," May 1948, Mr. Denlinger Has Provided the Full Details Here for the Benefit of Those Interested.

By WENDELL H. DENLINGER

Mechanical Engineer
Bunker Hill & Sullivan Mining & Concentrating Co.

ANTICIPATING the coming installation of a new hoist in our No. 1 Shaft, we started in 1943 to develop and use rubber-tread, shaft rollers. These replaced cast-iron rollers formerly used in all our shafts. During the past year we have been trying out a light-weight roller. The rollers have all been numbered and their location in the No. 1 shaft kept on record. A description of the three types of rollers follows:

Cast-iron Roller

This roller was used in our 50 deg incline No. 1 shaft before 1943 and carried a 1⅛ in. rope running at 1000 fpm. The ropes lasted less than a year. It is still used in shafts where space is limited and rope speed is low. Tread diameter—6 in.; length—8⅜ in.; bearing—Hyatt No. 18150; weight complete—45 lb; weight rotating parts only—40 lb; no grease seals used.

Steel Roller with Rubber Tread

These rollers have been used in the No. 1 shaft since January 1943 and are spaced about 50 ft apart. They carry a 1⅝-in. rope running at 1500 fpm, and the first ropes put on lasted two years and two months. Tread—synthetic rubber 9-in. diam by 7½ in. long, held between pressed steel flanges. Bearing—S K F No. 6207. Grease seals used and space between bearings packed with Lubriplate No. 110 grease. Grease seals offer some resistance to free turning, but keep the water out. Weight complete—56 lb; weight rotating parts only—49 lb; cost—$45 each; average life before replacement of parts—616 days (average of 47 rollers).

Lightweight Roller with Rubber Tread

These rollers have been used in the No. 1 shaft since June 1947. They are intended to replace the rubber-tread, steel roller. Tread—synthetic rubber vulcanized onto an aluminum shell. Tread and shell discarded when worn out. Size tread—9 in. diam by 7 ½ in. long; bearing spacer—aluminum pipe; end flanges—cast magnesium; bearing— S K F No. 6207-2RS. This is a double-sealed type furnished with lubricant sealed in. It allows for free rotation of the roller when new, but water occasionally enters the bearing. A better type would probably be with the bearing seal on the outside only, so that the space between bearings could be packed with grease to keep the water out. We are also considering use of an external shield on the shaft. Our present lubricant is Lubriplate No. 110, produced by the Fiske Bros. Refining Co. Weight of roller complete—26 lb; weight rotating parts only—19 lb; cost complete — $38.86 each; fillers — $13.92 each. Average life before replacement of parts (average of five rollers)—165 days.

The average life comparison bebetween the aluminum and steel roller should not be considered as unfavorable to the aluminum roller. Many of the steel rollers had been in the shaft since 1945 which brought up the average, but many of their treads were deeply grooved.

The magnesium-aluminum roller is also rust resistant and the lightweight makes it easier for the men to handle in the shaft.

We have also developed a slotted bracket which makes it easier and quicker to change rollers. Our present supplier is the Morris Machinery & Supply Co.

It is important that the rollers turn as freely as possible, since water and oil makes the rubber surface slippery and only a slight resistance is needed to prevent the roller from turning. Then the cable will start to cut into the tread and even into the metal shell. As soon as a deep groove forms in the tread, it tends to wipe the lubricant off the rope, exposing it to corrosion and greatly shortening its useful life. Some of the conditions that have stopped rollers in our mine have been:

(1) Water, usually containing acid, entering the bearings; this may be only a drip from the rock above

(2) Roller bracket touching edge of roller

(3) Too limited a clearance under the roller, allowing loose rocks or accumulated rope dope to touch the roller

(4) Bearings running dry

(5) Roller bracket becoming unfastened

(6) Bearings packed tightly with too viscous a grease.

We now have about 120 rollers in our No. 1 shaft alone which imposes a considerable maintenance job. A roller that will run without attention over a long period is much to be desired.

The 1⅝-in. ropes we are now replacing cost $4,250 each.

C & H Uses Heavier Rollers

Calumet and Hecla experimented with aluminum rollers equipped with rubber wearing surfaces for use as shaft rollers in inclined shafts. When an experiment conducted gave an estimated life many times that of the replaced wooden roller sections aluminum-rubber rollers were adopted for use in all shafts. Shaft rollers used by the Calumet and Hecla Consolidated Copper Co., Calumet, Mich., weigh only 90 lb. In addition to a weight saving of 20 lb per section the rubber-covered aluminum rollers offer numerous other advantages which warranted their adoption as standard equipment.

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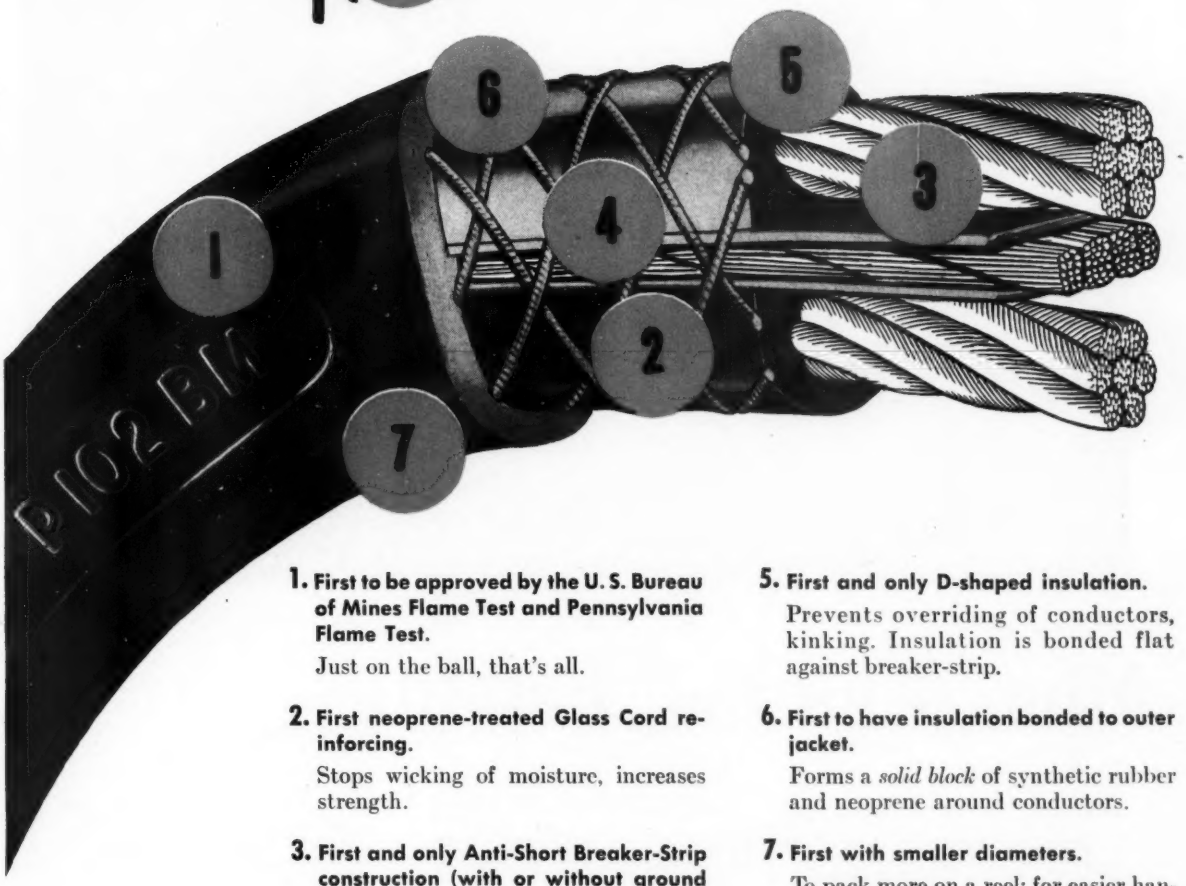

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Mine Roof-Fall Fatalities

A Report of the Roof Action Committee Preliminary to a Geologic Study Being Made to Develop Knowledge of Roof-Rock Characteristics That Will Aid in Accident Prevention in Coal Mining

★

PAUL H. PRICE

and

JOHN P. NOLTING

Respectively State Geologist and Assistant State Geologist, West Virginia Geological Survey

★

WHILE making a study of the physical properties of mine roofs, the authors had occasion to study the quarterly and annual reports of the West Virginia Department of Mines, especially the sections concerning fatal accidents and fatalities from roof falls. The figures used in this paper were obtained from these sources; however, the authors assume responsibility for their interpretation.

Table I compares the number of men killed annually in the coal mines of West Virginia with those killed by falls of roof. The percentage of those killed by falls of roof varies from a "low" of 42.1 per cent in 1942 to a "high" of 60.9 per cent in 1939, with an average over the ten year period of 50.1 per cent. A closer study of this table shows that, although the number of men killed by falls of roof has decreased each year for the last four years and is now considerably lower than the ten-year average, the per cent of these cases has not decreased appreciably and is in fact higher than the percentage for the ten-year period. The realization that half of the fatalities occurring in the mines of this State are due to roof falls, caused the West Virginia Geological Survey to want to participate and cooperate in

TABLE I—Number and percentage of Fatalities due to Roof Falls

Year	All Fatalities	Fatalities Due to Roof Falls	Per Cent Due to Roof Falls
1937	367	162	44.1
1938	239	130	55.4
1939	266	162	60.9
1940	376	163	43.4
1941	290	160	55.2
1942	380	160	42.1
1943	325	177	54.5
1944	313	155	49.5
1945	269	139	51.7
1946	243	130	53.5
10 yr.t'tl	3068	1538	50.1
Yr'ly avg.	306.8	153.8	

the work of the Roof Action Committee of the American Mining Congress.

Table II was compiled from the published accounts of deaths caused by roof falls from October 1945 to September 1947, the latest figures available at this time. The written account of each fatal accident was examined carefully and placed in one of three categories. The first category is composed of those accidents in which it is quite evident that the cause was the recklessness or indifference of the victim of the accident. For instance, in one case, a miner is reported to have sat down under a known bad piece of slate while his buddy went to get a post to support it. In many cases the reports say that the victim disregarded the foreman's warning of bad roof, in still other cases the victim went into marked danger areas, removed safety posts, returned under working roof to retrieve his tools, etc. During the two-year period under study this type of accident accounted for 27.7 per cent of all deaths caused by roof falls.

TABLE II

Roof Fatalities Reported Between October 1945 and September 1947

	Number	Per Cent
Total fatalities from roof falls	242	100.7
Apparently fault of individual concerned	67	27.7
Apparently caused by other "human element"	55	22.7
Total apparently due to "human element"	122	50.4
Considered as due to unforeseen bad roof	120	49.6

The second category includes those accidents in which it appears quite definite that the roof fall was the result of failure due to the "human element" other than the victim. In order to avoid drawing unjust conclusions, no finer distinction as to fault has been attempted. This category covers 22.7 per cent of the fatal accidents due to roof falls and includes such cases as lack of proper timbering, dangerous areas not marked off, foreman warning miners of danger but not remaining to see that proper precautions were observed, and knocking out posts by carelessness in haulage.

The third category includes those accidents in which it is not possible, from the published reports, to place the cause definitely on the "human element." This category covers 49.6 per cent of the accidents and is intended to include such things as kettle-bottoms, slips and bad roof in general, which have caused fatal accidents even though the timbering and general safety practices have apparently been up to standard. It is undoubtedly true that many cases which have been included in this third category would, if all the facts were known, really belong in one of the first two categories thus raising the percentage of accidents due to the "human element" and lowering the percentage of those resulting from bad roof.

Table III is a compilation of the mining experience of those killed by roof falls. The average mining experience of those killed is 18 years. The table shows that the miners with longer experience constitute a lower percentage of those killed. However, it should be borne in mind that the miners with longer experience records also constitute a smaller percentage of the total number of men employed. Although no attempt has been made to tabulate the number of miners by age groups, that should be placed in the first category of Table II, it was evident in the reports that the more experienced men were not by any means free from recklessness and indifference.

It would appear from a study of these tables that a decided decrease in the number of deaths due to roof falls is entirely possible, in fact the trend in recent years shows the beginning of such a decrease. If, as is indicated by Table II, at least half of the fatal accidents are the result of human failure, then by proper safety education, discipline, and leadership it should be possible to materially decrease the number of fatalities by enforcing safety measures and practices. As for the remaining 50 per cent of the fatalities, those classed as "true" accidents, it is hoped that the work of the Roof Action Committee will in time lead to the adoption of new safety practices and mining methods which will enable the mining industry to be able to predict more of the hazards of bad roof.

TABLE III

Mining experience of those killed by Roof Falls (October 1945 to September 1947).

86%	had over 5 years mining experience
73%	had over 10 years mining experience
59%	had over 15 years mining experience
45%	had over 20 years mining experience
33%	had over 25 years mining experience
21%	had over 30 years mining experience
12%	had over 35 years mining experience
5%	had over 40 years mining experience
1%	had over 45 years mining experience
Average had	18 years mining experience

Mine roof characteristics are clearly shown in strip pit highwalls

Completion of $750,000 addition to the Sullivan electrolytic plant will provide outlet for additional zinc concentrate production

Pine Creek Production Booms

By HARRY W. INGALLS
The "Wallace Miner"

Nearly 1000 Tons Daily of Zinc-Lead Concentrates Come From Five Mills. Nabob Tunnel and Other Developments Indicate Productive Future, Warranting Expansion of the Sullivan Electrolytic Zinc Plant.

MUCH time and effort has gone into the making of the Pine Creek zinc-lead area in the Coeur d'Alene mining district of Idaho. Prospectors and small stock companies have been digging away in this part of the district for the past 60 years, but only since World War II has Pine Creek come to be recognized as a potential mineral district of major proportions.

As late as 1942 there were only three small producing mines on the creek, the Highland-Surprise, Sidney and Little Pittsburg, with a total output for that year of 27,926 tons, having a gross value of $289,752. In 1943 Highland-Surprise was the only producer, with a record of only 19,404 tons, with a gross value of $335,956.

In 1944, due to the war demand for zinc and a premium price, the producing mines increased to six, the Highland-Surprise, Sidney, Little Pittsburg, Spokane-Idaho, Douglas and Lynch, with a combined output of 129,444 tons, having a gross value of $2,591,216.

In 1945, the same six mines produced a total output of 143,017 tons valued at $2,681,113, according to sworn statements on file with the county assessor of Shoshone County for all of the dates and figures quoted. At present the district is treating close to 1000 tons of ore per day in five operating milling plants.

Development of Sidney Mine Boosted Area

The development of the Sidney mine was really the turning point in the history of the Pine Creek belt. This property had been productive through World War I, but was closed down all the time between the wars because of

low zinc and lead prices. The property was virtually abandoned as a "dead duck" and was left in the lap of W. T. Simons, a bank cashier in Kellogg, who had been secretary of the company for 32 years. In 1942, Mr. Simons and a group of local stockholders in Kellogg decided to reopen the mine and do some prospect work. For this purpose they levied a small assessment.

About this time the U. S. Bureau of Mines' engineers appeared on the scene looking for strategic minerals, including zinc, and offered to diamond drill the Sidney because of its early production record. The result of this diamond drill work was the discovery of a remarkable orebody in the eastern portion of Sidney ground where no previous prospecting or mining had ever been done. Development work since that time has proven a virgin ore shoot of more than 1000 ft in length and from 5 to 15 ft wide at a depth of around 1000 ft. The company has erected a modern flotation concentrating plant of 300 tons daily capacity and is paying its stockholders dividends of 10¢ per share every three months, all of which has been accomplished with funds realized from development ore. The one assessment at the start was all the capital the stockholders had to put up. The company has already paid dividends of $1,223,685.00.

Highland-Surprise Conducted Successful Exploration

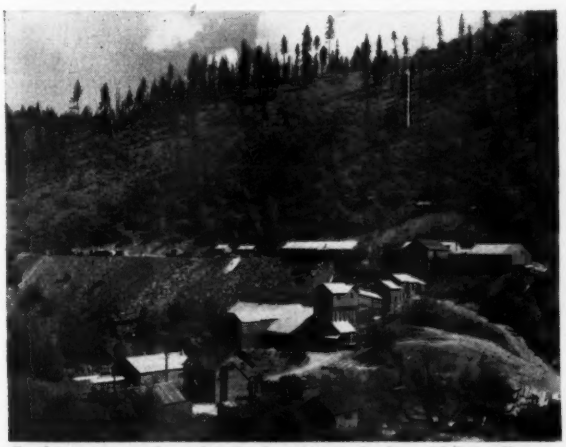
With the success of the Sidney operation, the management and stockholders of the adjoining Highland-Surprise mine were encouraged to carry on further exploration effort. During World War I the Highland-Surprise had produced ore, largely zinc, from the Highland vein. In 1942-43 the company started prospecting the Surprise vein and found it contained more lead. They followed this vein down with an inclined winze to the 1000 level and paid one dividend of 17½¢ per share, but later when mining costs for labor and materials increased, returns only paid the cost of operation. The Sidney operation suggested further prospecting, so the company engaged a diamond-drill crew and drilled a hole in the hanging wall on the 700 level south from the original vein, and in a distance of 40 ft the drill cut through a vein of high grade zinc-lead ore 15 ft wide. Holes were then drilled at intervals along the strike of the vein, proving an orebody of major importance several hundred feet in length. Diamond drilling was then continued still further south and resulted in the discovery of three other veins, making a total of five veins, three of which are now in production. The company has increased its milling capacity from 150 to 300 tons per day.

Spokane-Idaho Has Profitable Production

Located farthest east on the creek, the Spokane-Idaho property has been in more or less profitable production of zinc-lead ore for a number of years. During its early history it was known as the Constitution mine. It is de-

The 300-ton mill of the Sydney Mining Co. Discovery of a new ore body in 1943 encouraged other operations

Diamond drilling at the Highland-Surprise disclosed ore warranting expansion of milling facilities to treat 300 tons daily



Farthest east on Pine Creek, the 170-ton Spokane-Idaho mill produces both zinc and lead concentrates

The Douglas war-born 150-ton flotation plant continues to operate

veloped down to the 1400 level, or approximately 1900 ft below the surface outcrop. The company's flotation milling plant is treating about 170 tons of ore daily, producing separate zinc and lead concentrates.

Douglas Mine

The Douglas mine is located in between the Highland-Surprise and Spokane-Idaho. It is owned by the Douglas Mining Co., largely controlled by Bunker Hill and Hecla, but has been operated mostly by leasers. During World War I the Anaconda Copper Mining Co. operated it under lease and shipped hand-sorted zinc ore to the Anaconda smelter, mostly from surface workings down to the 400 level. During the last war the mine was operated by a local leasing company that put up a 150-ton flotation plant with government assistance. The company has paid dividends totaling $88,407.00.

Little Pittsburg Pays Dividends

The Little Pittsburg mine is owned by the Pine Creek Zinc-Lead Mining Co., of Seattle, and is under lease to the Denver Development Co. It is equipped with a 150-ton flotation plant and is paying dividends both to the leasers and the company. The company's share from royalties has been $96,785.00 up to date.

Ore Cut in Nabob Tunnel

Perhaps the most important new prospect development on the creek is at the Nabob property west of, and 600 ft deeper than the Sidney. This company is a local stock organization. The company first built a 300-ton milling plant and milled ore from the upper workings and later started a deep crosscut tunnel with the objective point 6,421 ft from the portal. This tunnel, about 8 by 9 ft in the clear, is equipped with the latest type electric haulage system and the best of everything in mechanical mine equipment and has made steady progress at the rate of 12 ft per day. The drive will crosscut the main Pine Creek mineral zone and has already been driven a distance of over 5000 ft. It has cut through two big mineral zones so far, the first of which is an exceptionally promising vein of lead ore in a highly bleached and hard formation, probably the middle Prichard. The best ore occurred on the foot-wall side of the vein and consisted of about 12 in. width of galena assaying 69 per cent lead, 12 oz silver and 4 per cent zinc. The vein structure is fully 50 ft wide, all highly mineralized with galena in blotches and inch-wide streaks. No drifting development has yet been attempted. The next vein cut was a zinc-lead zone, also wide, in the Prichard slate, containing 6-in. wide streaks of zinc-lead ore. The Sidney and Denver veins, that have been so highly productive, are still ahead of this development.

Sunset Minerals

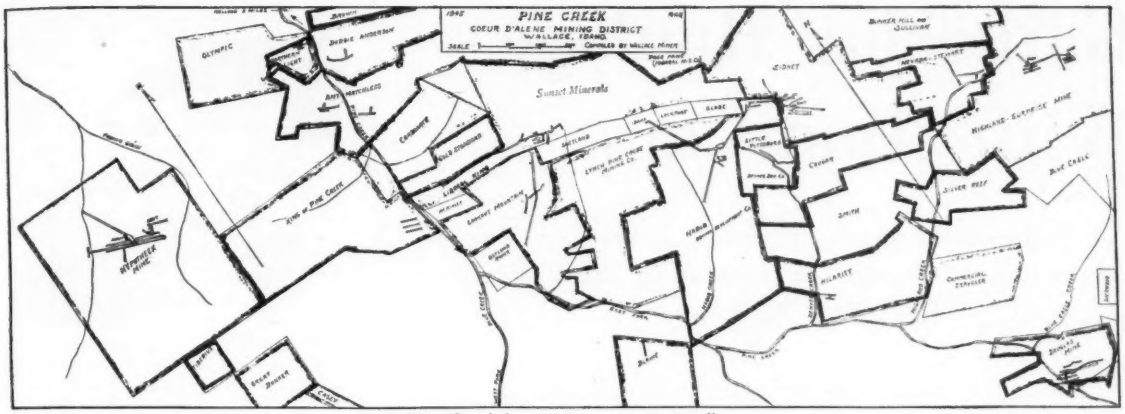
A Seattle company, the Sunset Minerals, purchased the Liberal King mine near the mouth of the creek under a lease and bond. Prior to this company's purchase the mine had developed a 12-ft-wide vein of low grade zinc-lead ore on the 1000 level. The Liberal King Co. and leasers made several attempts to mill the ore but without success. The Sunset Minerals put up a 150-ton flotation milling plant, ground the ore to 200 mesh, 100 mesh finer than the usual Coeur d'Alene milling practice, and made a successful and profitable operation. They have paid the Liberal King Co. $25,500 in royalties and in 1947 made a net profit of $31,394.

There are a number of other mining companies on Pine Creek engaged in prospecting operations that have not yet discovered orebodies of importance.

Sullivan Zinc Plant Expansion

The Sullivan electrolytic zinc plant in Government Gulch, near Kellogg and just a few miles north of the Pine Creek district, was constructed by the Sullivan Mining Co., a subsidiary of Bunker Hill and Hecla, at an original cost of $3,050,000. For several years this plant, under the management of Wallace Woolf, conducted experiments on zinc and finally produced commercial quantities 99.99+ per cent pure zinc, that has since become the principal die-casting metal. The plant treats custom ores but for several years was unprofitable, because of the low price of zinc, and operated at only part capacity. At present, however, the plant is operating at full capacity, treating 7800 tons of zinc concentrates daily. In addition, a large surplus tonnage is shipped to Anaconda and such a large surplus stockpile has been accumulated that it has been found necessary to curtail zinc-concentrate purchases by one-third until such time as the company can complete the $750,000 addition to the plant.

The Nabob 300-ton mill will treat ore recently cut in the Nabob tunnel



Pine Creek boasts five operating mills

Geology of Pine Creek District

Both the U. S. Geological Survey and the U. S. Bureau of Mines are now engaged in making a geological map of the entire Pine Creek area, including both the east and west forks of the creek. In a recent report on the district the Bureau of Mines says:

"The Pine Creek topography is similar to that of most of the greater Coeur d'Alene mining district. The folded and inclined sedimentary rocks underlying the area have strongly controlled the development and evolution of the topography throughout a complicated history of diastrophism and erosion. The result is a region of completely folded mountains in an early mature cycle of erosion. The mountain slopes are steep but rounded. The smaller streams have steep, short, narrow valleys, but the master streams of the area have fairly broad floors and moderate gradients.

A single formation of the Belt series, the Prichard, of Proterozoic (Algonkian) age underlies most of the Pine Creek area. The Prichard is the lowest and the thickest of the four Belt series formations. It is probably more than 12,000 ft thick. The Prichard formation is composed chiefly of distinct and regular bandings of gray and black argillite; locally it is termed slate. Clearly distinguishable marker beds, approximately in the middle of the formation, consist largely of massive white quartzites. These marker beds are referred to as the Middle Prichard quartzites.

"The Prichard formation has been deformed by close local folding on a small scale and by at least one broad anticlinorial fold. The amplitude of the broad folding is of such proportions that the Prichard formation dips northeasterly throughout the Pine Creek district. In the northwestern part of the district the formation dips northeast steeply, but towards the southeast the rocks become relatively flatter in dip. Bedding strikes have principal trends in a NW-SE direction.

"The Prichard formation has also been subjected to large-scale faulting, in which the movement has been assumed to largely horizontal. Most mines in the Pine Creek district are north of the Placer Creek fault, which is a normal fault with a steep southeasterly dip. This fault has been traced east-west along its strike for about 35 miles. In consequence of the major faulting, accompanied, no doubt, by folding of the beds, there has been developed a broad zone of subordinate fractures, some of which are favorable for ore deposition. These fractures diverge at acute angles from the major faults; they are of much smaller displacement than the larger, more continuous, barren major faults. The Sidney mine is on one such fracture from the Placer Creek fault. The zone diverges from the Placer Creek fault at the Highland-Surprise mine and extends 24,000 ft N 60-70 W. It is roughly parallel to the general trend of the Prichard bedding, but it dips transversely to the dip of the bedding. It also cuts indiscriminately through a number of strong east-west folds. These folds are much more strongly developed in the easterly end of the district than they are in the westerly end. The Sidney mine is in the area of greatest folding."

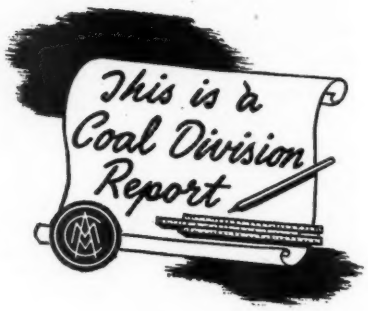
In a scenic setting near the mouth of Pine Creek, Sunset Minerals treats 150 tons daily

Wire Rope Characteristics

A little known characteristic of wire rope is that, with a change in the size of rope, the breakage strength does not vary in proportion to the metallic cross-sectional area, as it would in the case of a bar of steel.

The cross-sectional area of wire rope varies with the square of diameters, the same as in the case of a round bar, but because smaller wires are used in smaller rope, the strength of these smaller wires per square inch of rope area is greater than that of the larger ones.

Gathering Haulage With Mine Cars



A Supplement to the Report Published in August, Submitting Estimates on Operating Track Haulage in a 3-ft Seam

By the Committee on Haulage Roads

IN the August 1948 MINING CONGRESS JOURNAL the Haulage Committee presented estimates on track gathering haulage in the several grade conditions as agreed upon jointly with the Conveyor Committee. The report covered 6-ft and 4-ft seam heights only and a recent meeting of the two committees recommended that it be supplemented by estimates for 3-ft seams so as to parallel the report by the Conveyor Committee on gathering haulage with belts, published in the January 1948, MINING CONGRESS JOURNAL. This supplement is presented here.

Being in effect a continuation of the August publication, this report follows the same general specifications as in the estimates for the 4-ft and 6-ft seam heights and also uses the same estimates for the amount and cost of the track and wiring materials. These figures are not repeated but for the purpose of comparison, a summary of all costs is given in the table on the following page. Low coal, however, introduces some new factors. Based on an 80 percent recovery, the standard panel would produce only 103,680 tons of coal. Also, the committee felt it would not be practicable to produce 1200 tons per shift from the three panels used in the estimates for the 4-ft and 6-ft seams, and that an extra developing entry would be needed. This, in turn, leads to the requirement of more mine cars. The effect of these new factors is shown in the accompanying tables and explained in more detail in the following paragraphs.

Mine Cars

Assuming that the servicing time is not changed, the fourth entry will require an increase of eight cars in the mine complement, making a total of 43 cars for gathering as compared to 35 used in the higher coals. At a purchase price of $825 each, the cost of 43 cars is approximately $36,000 and for an annual production of 600,000 tons, based on 10 percent depreciation, 3 percent interest and a 10 percent supply cost, the per ton cost of the mine cars would be:

Investment cost	$ .0077 per ton
Maintenance cost	$ .0060 per ton
Total cost	$ .0137 per ton

Track and Wiring

Theoretically, in order to operate four panels, two developing and two retreating, by transferring material, the track and wire needed would be the amount required to completely equip only two panels. However such

ESTIMATED TRACK COST IN A 3-FT SEAM

Material Cost for four panels, $12,501.14	
Depreciation at 10% and	
Interest at 3% on $12,501.14 equals $1,625.00 for year	
Investment cost for annual production of 600,000 tons equals	$.0027 per ton
Replacement cost of $827.87 for 103,680 tons equals	.0080 per ton
Labor:	
3000 ft track at $1.25 equals $3,750.00	
10 switches at $73.50 ... 735.00	
$4,485.00 for 103,680 tons equals	.0433 per ton
Total Cost of Track	$.0540 per ton

ESTIMATED WIRING COST IN A 3-FT SEAM
For Level, Plus and Minus 2% and 4% Grades with the Loads

Material Cost for four panels, $4,004.58	
Depreciation at 10% and	
Interest at 3% on $4,004.58 equals $520.60 for year	
Investment cost for annual production of 600,000 tons equals	$.0009 per ton
Replacement cost of $250.73 for 103,680 tons equals	.0024 per ton
Labor:	
30 man-shifts at $8.00 equals $240.00 for 103,680 tons	.0022 per ton
Total Cost of Wiring	$.0055 per ton

ESTIMATED WIRING COST IN A 3-FT SEAM
For 4% Grades Against the Loads

Material Cost for four panels, $7,141.28	
Depreciation at 10% and	
Interest at 3% on $7,141.28 equals $928.37 for year	
Investment cost for annual production of 600,000 tons equals	$.0015 per ton
Replacement cost of $408.98 for 103,680 tons equals	.0039 per ton
Labor:	
36 man-shifts at $8.00 equals $288.00 for 103,680 tons	.0028 per ton
Total Cost of Wiring	$.0082 per ton

ESTIMATED COST OF ROOF BRUSHING IN 3-FT SEAM

Equipment Cost equals $3,500	
Depreciation at 10% and	
Interest at 3% on $3,500 equals $455 for one year	
Investment cost for annual production of 600,000 tons equals	$.0008 per ton
Maintenance and supplies at 10% equals $350 per year, and equals	.0006 per ton
Labor:	
4 man-shifts per day at $8.00 equals $32.00 for 2400 tons and equals	.0133 per ton
Cost of roof brushing	$.0147 per ton

an equipment limitation would retard development as the exact amount would provide neither spares nor replacements. It is therefore assumed for the total operation that sufficient track and wire should be purchased to equip 2 1/3 panels, which is the figure used in the accompanying tables.

An extra item in the 3-ft operation, not needed in the higher seams, is rock brushing along the haulage ways to give a height of 6 ft.

Locomotives

The power used by the gathering locomotive, expressed as the annual kilowatt-hour consumption, was given in the August report as listed below; these values are considered as applying to all seam heights but, for clarification, an explanation of how they were calculated is submitted.

Level grade	63,750 kwhr
Plus 2% grade.....	101,500 kwhr
Plus 4% grade.....	185,000 kwhr
Minus 2% grade.....	36,750 kwhr
Minus 4% grade.....	74,500 kwhr

Energy at the locomotive wheels in foot-pounds is the product of tractive effort in pounds (TE) and the distance traveled by the locomotive in feet (D). Dividing this by 1,980,000 converts foot-pounds into horsepower hours. Multiplying by 0.746 converts horsepower hours to kilowatt-hours and dividing by 0.85 as the over-all efficiency of gearing and motors gives the kilowatt hours input to the motors. Multiplying further by 1.4 adds 40 percent for locomotive rheostat losses, line losses, etc., and the kilowatt-hours chargeable to locomotive operation may be then written:

$$\frac{TE \times D \times .746 \times 1.4}{1{,}980{,}000 \times .85}, \text{ or}$$

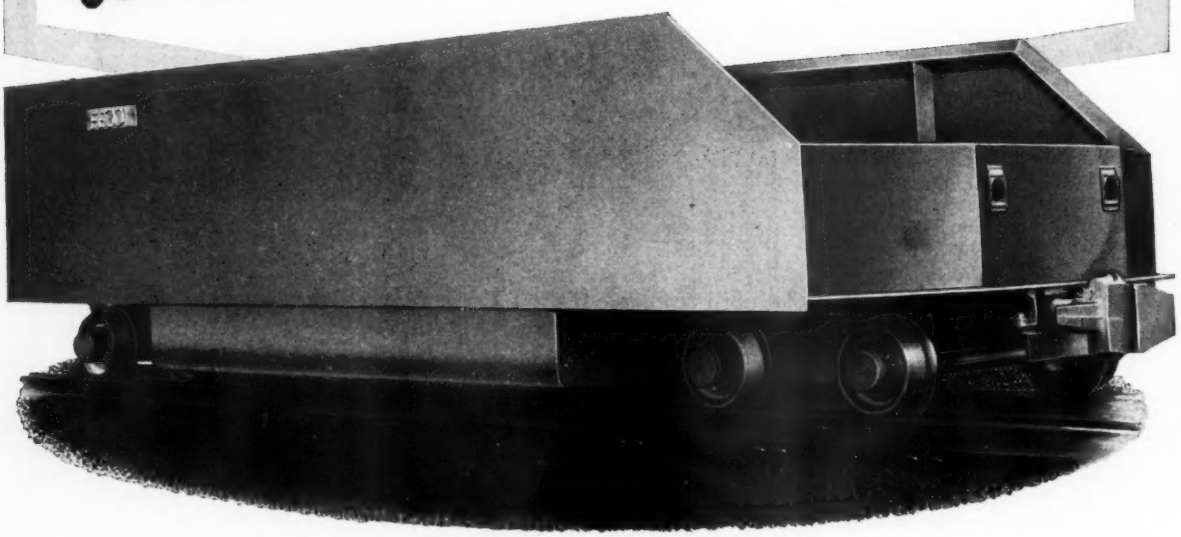
$$kwhr = \frac{TE \times D}{1{,}610{,}000}$$

When the car service is 1½ hrs, as explained in the August report, a locomotive in a 7-hr shift will travel a total distance of approximately 62,000 ft—31,000 ft in hauling loaded trips and 31,000 ft hauling empties. These distances are the values for (D) to be used in the formula. On level grades the tractive effort (TE) will be 4860 lb for the loads, as shown in the August report, and 1800 lb is taken for the empties—a direct ratio between the weight of the loaded and empty trips. Substituting the values in the formula, gives a power consumption of 93 kwhr per shift for hauling the loads, and 34.5 kwhr for the empties, making a total of 127.5 kwhr per shift. Two shifts per day for 250 days, gives an annual consumption of 63,750 kwhr for level grades. Values for the 2 percent and 4 percent grades are calculated in the same manner except it is assumed that no power is used for trips on down grades.

SUMMARY OF COSTS FOR TRACK GATHERING HAULAGE

	Operating a 6-ft Seam				Operating a 4-ft Seam				Operating a 3-ft Seam			
	Investment	Supplies	Labor	Power	Total	Investment	Supplies	Labor	Power	Total	Investment	Supplies	Labor	Power	Total
Level Grade: Locomotives	.0023	.0018	.0074	.0021	.0136	.0023	.0018	.0074	.0021	.0136	.0023	.0018	.0074	.0021	.0136
Mine Cars	.0062	.0048	.0216	.0279	.0110	.0062	.0048	.0325	....	.0110	.0077	.0060	.0433	....	.0137
Track	.0023	.0040	.0216	.0279	.0030	.0023	.0060	.0325	....	.0408	.0027	.0080	.0433	....	.0540
Wiring	.0007	.0012	.0011	....	.0030	.0007	.0019	.0018	....	.0044	.0009	.0024	.0022	....	.0055
Brushing	....	....	....	....	....	....	....	....	....	....	.0008	.0006	.0133	....	.0147
Total	.0115	.0118	.0301	.0021	.0555	.0115	.0145	.0417	.0021	.0698	.0144	.0188	.0662	.0021	.1015
Plus 2%: Locomotives	.0030	.0023	.0076	.0034	.0163	.0030	.0023	.0076	.0034	.0163	.0030	.0023	.0076	.0034	.0163
Mine Cars	.0062	.0048	.0216	....	.0110	.0062	.0048	.0325	....	.0110	.0077	.0060	.0433	....	.0137
Track	.0023	.0040	.0216	....	.0279	.0023	.0060	.0325	....	.0408	.0027	.0080	.0433	....	.0540
Wiring	.0007	.0012	.0011	....	.0030	.0007	.0019	.0018	....	.0044	.0009	.0024	.0022	....	.0055
Brushing	....	....	....	....	....	....	....	....	....	....	.0008	.0006	.0133	....	.0147
Total	.0122	.0123	.0303	.0034	.0582	.0122	.0150	.0419	.0034	.0725	.0151	.0193	.0664	.0034	.1042
Plus 4%: Locomotives	.0054	.0041	.0150	.0062	.0307	.0054	.0041	.0150	.0062	.0307	.0054	.0041	.0150	.0062	.0307
Mine Cars	.0062	.0048	....	....	.0110	.0062	.0048	....	....	.0110	.0077	.0060	.0433	....	.0137
Track	.0023	.0040	.0216	....	.0279	.0023	.0060	.0325	....	.0408	.0027	.0080	.0433	....	.0540
Wiring	.0013	.0021	.0015	....	.0049	.0013	.0030	.0021	....	.0064	.0015	.0039	.0028	....	.0082
Brushing	....	....	....	....	....	....	....	....	....	....	.0008	.0006	.0133	....	.0147
Total	.0152	.0150	.0481	.0062	.0845	.0152	.0179	.0496	.0062	.0889	.0181	.0226	.0744	.0062	.1213
Minus 2%: Locomotives	.0023	.0018	.0074	.0012	.0127	.0023	.0018	.0074	.0012	.0127	.0023	.0018	.0074	.0012	.0127
Mine Cars	.0062	.0048	....	....	.0110	.0062	.0048	....	....	.0110	.0077	.0060	.0433	....	.0137
Track	.0023	.0040	.0216	....	.0279	.0023	.0060	.0325	....	.0408	.0027	.0080	.0433	....	.0540
Wiring	.0007	.0012	.0011	....	.0030	.0007	.0019	.0018	....	.0044	.0009	.0024	.0022	....	.0055
Brushing	....	....	....	....	....	....	....	....	....	....	.0008	.0006	.0133	....	.0147
Total	.0115	.0118	.0301	.0012	.0546	.0115	.0145	.0147	.0012	.0680	.0144	.0188	.0662	.0012	.1006
Minus 4%: Locomotives	.0046	.0036	.0147	.0025	.0254	.0046	.0036	.0147	.0025	.0254	.0046	.0036	.0147	.0025	.0254
Mine Cars	.0062	.0048	....	....	.0110	.0062	.0048	....	....	.0110	.0077	.0060	.0433	....	.0137
Track	.0023	.0040	.0216	....	.0279	.0023	.0060	.0325	....	.0408	.0027	.0080	.0433	....	.0540
Wiring	.0007	.0012	.0011	....	.0030	.0007	.0019	.0018	....	.0044	.0015	.0039	.0028	....	.0082
Brushing	....	....	....	....	....	....	....	....	....	....	.0008	.0006	.0133	....	.0147
Total	.0138	.0136	.0274	.0025	.0573	.0138	.0163	.0490	.0025	.0816	.0173	.0221	.0741	.0025	.1160

Like 'Em ALL-STEEL ...and Welded?



Here's one unit of an order recently built and delivered by Bethlehem. It's an all-steel job (steel for durability!) and the body is welded throughout.

Note, too, that it's equipped with eight forged-steel wheels, roller-bearing trucks, and automatic self-centering couplers. It's big . . . 10-ton capacity . . . to handle the big loads so common nowadays.

This car is a good example of what Bethlehem can turn out in its modern, well-equipped shops. Whether you want end-dump or rotary-dump, high- or low-side cars, let us help you plan them. From blueprint to the finished product, you can rely on us for a job well done.

Bethlehem all-steel mine cars last for years. They are built to absorb punishment day in, day out. As a result, your shop maintenance facilities need not be extensive; the cars go right on plugging, with little time out for repairs. See us for both eight- and four-wheel jobs in either welded or riveted types.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

MOST of the House and Senate members have now taken to the field in active participation in the campaign for the November elections. Here in Washington, however, the executive departments, bureaus, and agencies continue to grind on the overhauling of regulations and on consideration of cases which are constantly arising under administrative procedure.

The Government Reorganization Commission under former President Herbert Hoover is driving ahead on a much needed but little publicized work. Mr. Hoover has stated that 22 special task groups are preparing reports and recommendations for greater efficiency and economy in government. These recommendations will call for an increase in the number of cabinet officers and will be given intensive study by the Com mission late this Fall. Mr. Hoover has sounded a warning that current heavy taxes "seriously curtail the whole economic and social advance in the U. S." He asserted that the tax burden is so great that fundamental savings are being drawn into the Treasury and that "We saw evidences of this last year in the large amounts of long-term capital borrowed from banks, instead of investors, a process that cannot go on for long."

Steel Allocations

For the anthracite mining industry, Commerce Secretary Sawyer and Attorney General Clark have now approved a voluntary plan allocating 12,380 tons of steel products monthly for the period October through February for operation, maintenance, and repair of mining and preparation facilities.

On October 6 the Steel Industry Advisory Committee of the Department of Commerce will consider recommendations for 376,200 tons of steel to be allocated for maintenance, repair and operating supplies for the bituminous coal mining industry, and 574,600 tons of steel for mining machinery for coal, metal, and nonmetallic mining. At a meeting of the National Minerals Advisory Council at San Francisco September 24, the Council recommended an allocation of 306,380 tons of steel for maintenance, repair and operating supplies for metal and nonmetallic mines and smelters.

Basing Point

Senator Capehart's (R., Ind.) 46-man Advisory Council under Dr. Melvin T. Copeland has scheduled a two-day meeting in Chicago beginning October 21 to draw up recommendations. Capehart has asked the Council whether uniform prices, uniform zone prices, prices of manufacturers based on freight equalization, and prices reached by a seller in absorbing freight to meet the lower prices of a competitor located closer to the customer, are to the best interests of our national economy.

Secretary of Commerce Sawyer has urged business men and consumers to make a careful study of the basing point price situation and to present their views to Congress. Sawyer declared, "Whether or not the Supreme Court decision actually requires the drastic pricing changes which some members of industry feel that it does require, the fact remains that many changes are already being made and that the effect both on the producer and the purchaser has been unsettling. It is too soon to tell what the ultimate result of the Supreme Court decision will be. It is obvious, however, that any extensive revision of pricing practices by industry will affect existing patterns of distribution, particularly in those industries where transportation represents a significant part of the delivered price of a product."

Senator Capehart's special committee studying the effects of the Supreme Court's basing point decision plans to conduct hearings beginning November 15.

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Washington Highlights

HOOVER COMMISSION: Speeding work on Government Reorganization.

STEEL: Allocation asked for mining.

BASING POINT: Legislative action?

STOCKPILING: Program stepped up.

DRAFT: Deferments up to local boards.

FOREIGN MINERS: DP Commission asks manpower needs.

UMWA: NLRB brings action on union shop.

TAFT-HARTLEY: NLRB and courts rule.

FREIGHT RATES: Further increases sought.

MINERAL LEASES: Regulations liberalized.

★ ★ ★ ★ ★ ★ ★

Stockpiling

In a special report the Munitions Board has stated that the strategic and critical materials stockpile is about 18 percent complete. This consists of stocks on hand in 85 storage locations totalling $597,000,000 in value; the original program called for an accumulation valued at $3,403,000,000. Improvements in the program are predicted as the result of operation of the European Recovery Program which requires the 16 participating nations to assist the U. S. in acquiring raw materials for stockpiling, together with placing by the Board of long-term contracts in an effort to expand U. S. production, and solicitation of the help of American industry in locating and purchasing raw materials which may be surplus to the needs of private owners.

Newly appointed chairman of the Munitions Board is Donald F. Carpenter, former vice-president of Remington Arms Co. Carpenter, who has been serving as chairman of the Mili-

tary Liaison Committee of the Atomic Energy Commission, succeeds Thomas J. Hargrave, who returns to his civilian post as president of Eastman Kodak Co.

Military Draft

Selective Service officials advise that responsibility for deferring men on account of their civilian occupation will remain in the local draft boards, but it is understood that the boards will use discretion in interpreting draft regulations in order to minimize dislocation of industry. Officials of Selective Service, U. S. Employment Service and the National Security Resources Board have been urged to accord preferred status to mining employes in the event any lists of preferred industries and occupations are promulgated.

It is suggested that mining companies analyze the draft status of their employes and furnish data to local draft boards and the U. S. Employment Service. Such information should include total number of men employed in the 19-25 age group, broken down to indicate how many are veterans, how many are National Guard or organized reserves, and how many have not had previous or present military service. Of the latter group a further breakdown should show number of men married, number single with dependents, and the number single without dependents. The single men without dependents should then be classified by occupations or skills.

Foreign Miners

A member of the Displaced Persons Commission has just stated that there are many miners and men capable of being made into miners among the displaced persons who will be brought to the U. S. as rapidly as they can be prepared for transportation to our ports. This Commission urges that mining companies in need of men immediately address the Commission in the State Department advising the number of men needed for whom housing can be provided, and stating the willingness of the employer to pay transportation from the port of entry to the mines.

UMWA Union Shop

Early in September General Counsel Denham of NLRB filed a brief with the Board reenforcing his contention that the union shop clause in the UMWA's wage contract with the captive coal mine operators violates the Taft-Hartley Act. Denham also insisted that UMWA officials must sign non-Communist affidavits and hold an election on the union shop provisions before the current contract with the captive operators will be legal. Denham stated in his brief that the facts "present a very simple picture—that of a union and its agents, in complete and obdurate disregard of the law of the land, demanding a single 'union shop' contract from employes, without compliance with the conditions which the Act requires."

Meanwhile a Federal district judge in Fort Wayne, Ind., is expected to cite the International Typographical Union for contempt for violation of a temporary injunction restraining the union and its officers from violations of the closed shop prohibition of the Taft-Hartley Act.

Labor Cases

In Chicago the U. S. Circuit Court of Appeals ruled, on September 23, that retirement and pension plans must be submitted to collective bargaining negotiations by employers upon demand of unions. The case involved the Inland Steel Co. and the CIO United Steel Workers and arose over the retirement of 224 employes over 65 years of age. The union demanded the right to bargain over the case of each employe separately on the issue of physical fitness to continue work and on the right to include the terms of the pension plan in collective bargaining as it related to all employes. The company will appeal to the Supreme Court.

The NLRB ruled September 1 that employes on strike for higher pay cannot vote in collective bargaining elections if their jobs have been filled. This decision was based on a section of the Taft-Hartley Act which provides that "employes on strike who are not entitled to reinstatement shall not be eligible to vote," but the Board held in effect that only those on strike because of an employer unfair labor practice are entitled to reinstatement and to vote in a bargaining election.

On August 18 the NLRB ruled out the hiring halls of the Maritime Unions as illegal under the Taft-Hartley Act.

In issuing a permanent injunction restraining an IUMMSW local union from "interfering with, threatening, intimidating, or using force against any non-striking employes" at the Metaline Falls, Wash., plant of the American Zinc, Lead and Smelting Co., Judge W. L. Johnson stated in part:

"Our sympathies naturally turn to the man who labors daily, but those men must conduct themselves as loyal, law-abiding American citizens or you cannot ever expect to call upon the courts of the country to protect you under the Constitution and under the laws that have been enacted, whether you like the law or whether I like it. When the Congress enacts a law and the President, as he did, vetoed the Taft-Hartley Act, it was passed by a coalition of Democrats and Republicans over his veto and it is the law of the land, and it is the one that we are going to abide by until the Supreme Court of the United States says that it is unconstitutional or until the Congress repeals it. To do otherwise is to take this case outside the pale of the law, and that applies to the plaintiff in this case as well as to the union."

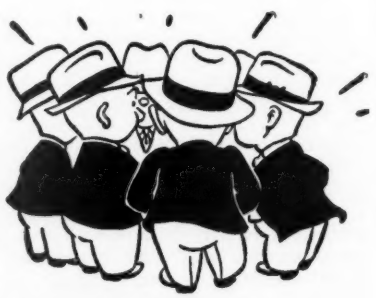
Freight Rates

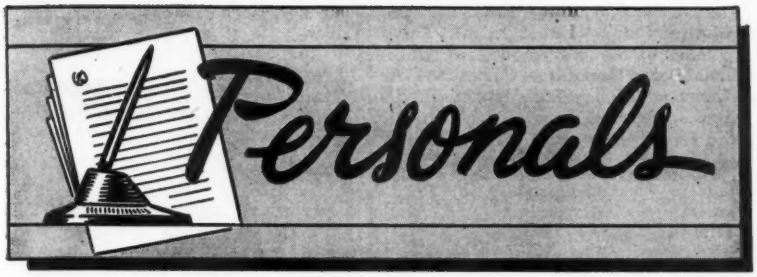
Railroad traffic executives meeting in Chicago on September 23 announced that a request will be made for an 8 percent increase in most freight rates, estimated to cost shippers $400,000,000 annually.

W. H. Dana, chairman of the Western Traffic Executives Committee, has stated that a petition by the railroads filed with the ICC August 26 to raise the rates on coal and coke in all territories, will be amended to ask an additional 5¢ a net ton or 6¢ a gross ton; and that the proposed increase on iron ore in eastern and southern territory will be raised to 5¢ per ton, net or gross. On iron ore in the western territory the proposed increase is 25¢ per net or gross ton except to the head of the lakes for water shipment beyond.

Mineral Lease Regulations

Implementing certain provisions of the Hatch Act (S. 1006)—80th Congress, the Bureau of Land Management has issued regulations which permit the Secretary of the Interior to waive, suspend, or reduce the rental or minimum royalty or reduce the royalty on an entire leasehold or any deposit, tract, or portion thereof segregated for royalty purposes whenever he determines it necessary to promote development or finds that leases cannot be successfully operated. To obtain the benefits extended by these regulations, an application must be filed in triplicate in the office of the mining supervisor for coal, phosphate, potassium, sodium, oil shale, and sulphur leases.





On September 1, 1948, **Walter C. Lawson** assumed his duties as general superintendent of the New Cornelia Branch of Phelps Dodge Corp. He had been general superintendent of the Morenci Branch, Phelps Dodge, since January 1, 1946.

Mr. Lawson, a graduate of Michigan College of Mines, was first employed by Phelps Dodge Corp. at the New Cornelia Branch in Ajo as a mining engineer in May of 1926. When the stripping operations at the Morenci open-pit mine were started in 1937, Lawson was transferred from Ajo to Morenci as chief mine engineer. He was appointed mine superintendent of that property in 1942, then promoted to general superintendent in 1946.

Warren E. Fenzi succeeds Mr. Lawson as general superintendent of the Morenci Branch. He entered the employ of Phelps Dodge at Morenci in July of 1937 as a mining engineer, and has filled successively the positions of mine engineer, assistant drilling and blasting foreman, assistant mine superintendent and mine superintendent, holding the last position since July 1, 1947.

Robert P. Koenig, president of Ayrshire Collieries Corp. and chairman of the National Bituminous Coal Advisory Council to the Secretary of the Interior, has been named a special consultant on coal and coal mining problems to the Economic Cooperation Administration mission in London. Mr. Koenig sailed from New York the latter part of September and will return around November 1.

Perry Franklin Roys, East Helena, Mont., has been appointed to the faculty of the Montana School of Mines as instructor in economics. He will do research work in the economics of the mineral industry, one of the projects of the Montana Bureau of Mines.

James H. Pierce, of Pierce Management, Scranton, Pa., left for China on September 29 in connection with the mining program of the National Resources Commission of China. He will return about the middle of November.

Fred D. Kay was recently elected vice-president of the International Titanium Corp. Mr. Kay is also secretary of the Patent Committee of Metal & Thermit Corp. and ore dressing consultant for this organization.

After nearly 50 years of experience in various phases of the bituminous coal industry, **William M. Wilshire** retired as secretary-treasurer of Appalachian Coals, Inc., August 31. He has been associated with Appalachian Coals, Inc., since 1934. He was at one time vice-president of the Carnegie Coal Co. and president of the West Virginia Coal and Coke Co.

Ralph W. Neyman, general mine superintendent of the Hecla Mining Co., was elected to the board, succeeding Leo J. Hoban. Mr. Neyman has been with Hecla since May 1930 and has held key positions in directing important work, including operation of the Atlas mine at Mullan, Idaho, where an 800-ft development shaft was sunk. He was also in charge of Hecla's Rock Creek operations, after which he was appointed the company's general superintendent in charge of all mining operations in the district.

Damon R. Surgener is now associated with the Blue Grass Coal Co. as vice-president. His time will be divided between sales and operating activities with offices in Cincinnati and Hazard, Ky.

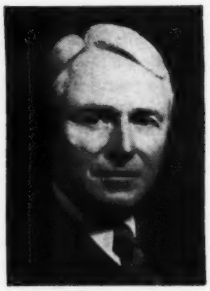
1949 Coal Convention and Exposition

THE American Mining Congress takes pleasure in announcing that L. Ebersole Gaines, president, The New River Co., has accepted the chairmanship of the Program Committee for the 1949 Coal Convention and Exposition. Mr. Gaines, prominent in the industry, and well known as a forward-looking operating executive, will be assisted by a Committee of operators and manufacturers who have led in promoting modern technique for the improvement of coal mining. This Committee will meet in the near future to carry out its important task of organizing the Convention sessions, determining subjects of the greatest timely interest, and selecting the best qualified speakers to present them.

The 1949 meeting is to be held at the Public Auditorium in Cleveland, Ohio, the week of May 9, and will again feature a full-scale Exposition of mining machinery, equipment, and supplies. The displays will include every type of machine for deep mining and open-pit operation—new designs as well as improvements in older models—together with the latest developments in coal-cleaning processes and preparation equipment.

To assure full use of Cleveland's hotel facilities, all reservations are being handled by a Housing Bureau. First assignments will be made in December, *and all mining men are urged to send in their requests promptly, specifying arrival date and type of room preferred to Louise D. Perkins, Director, Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13, Ohio.*

Dr. Donald H. McLaughlin, president of the Homestake Mining Co., has been elected a director of the International Nickel Co. of Canada, Ltd. He fills the vacancy on the board caused by the death of William N. Cromwell, former member of the firm of Sullivan & Cromwell. Dr. McLaughlin, one of the country's best known geologists and authorities on mining and prospecting, is also a director for the Cerro de Pasco Copper Corp., Empire Trust Co. of New York, The Dorr Co., San Luis Mining Co., and American Trust Co. of San Francisco. He is also chairman of the National Minerals Advisory Council and chairman of the Advisory Committee on Exploration and Mining of the Atomic Energy Commission.



Dr. Carey B. Jackson, research chemist of the Mine Safety Appliances Co., has been awarded the U. S. Navy's Public Service Award, the highest award that can be made to civilians by the Secretary of the Navy. Dr. Jackson received this award for his contribution to the development of navy oxygen breathing apparatus and the engineering development of the commercial production of potassium, potassium-sodium alloys and their oxides in World War II.

John W. Hill has been appointed general superintendent of operations in the Colorado area and **David D. Baker** has been appointed manager of tungsten operations for the United States Vanadium Corp., J. E. Horn, vice-president, has announced. Mr. Hill, former acting superintendent for the area, will have full charge of operations at Uravan and Rifle, Colo.

Mr. Baker, former superintendent of the mine and mill at Winnemucca, Nev., will be in full charge of all operations at Bishop, Calif., and Henderson and Winnemucca, Nev.

Rear Admiral Francis C. Denebrink, USN, is now Navy Director, Munitions Board, succeeding **Rear Admiral Roger W. Paine,** USN, who is now Deputy Inspector General, Bureau of Ships in the Western Sea Frontier. Admiral Denebrink formerly commanded the naval forces at Eniwetok for atomic tests in Operation Sandstone.

Admiral Paine served as manager of the Industrial Department, Navy Yard, Pearl Harbor, T. H., from May 1942 to October 1944. From the time Admiral Paine was assigned as Navy member of the Army and Navy Munitions Board Executive Committee, he directed the board's activities in foreign trade and stockpiling critical and strategic materials.

Louis K. von Perbandt and **Lee R. Richards,** engineers with the Paul Weir Co. and Mines Engineering Co., left September 8 for the British Isles to serve the National Coal Board in the capacity of consultants on special problems. Mr. von Perbandt and Mr. Richards sailed from New York on the Queen Elizabeth.

James Sweet, mining engineer, who recently returned from Northern Rhodesia, is now connected with the Tungsten Mining Corp. at Henderson, N. C.

Dr. A. B. Parsons has resigned as secretary of the American Institute of Mining and Metallurgical Engineers, after 18 years in that position. **E. H. Robie,** editor of Mining and Metallurgy and Dr. Parson's assistant for most of his tenure in office, has been named acting secretary for the remainder of the year. Dr. Parsons will make his home at 6091 Castle Drive, Oakland, Calif., after November 1.

A. B. Parsons

— *Obituaries* —

Paul J. Sirkegian, 52, Nevada mining executive and civic leader, died in a Salt Lake City hospital in August of complications following an operation. He was general superintendent of Consolidated Copper Mines Corp. at Kimberly, Nev., since 1926. Previous to that date he was associated with the Nevada Consolidated Copper Co., Ruth, Nev., for the two years following his graduation from the University of Nevada in 1924.

B. Gustaf Thele, chief engineer for the coal mines of Tennessee Coal, Iron and Railroad Co., passed away July 20. Mr. Thele came to this country from Sweden in 1912 and resided in Birmingham, Ala., until the time of his death.

Ray W. Smith, 65, chief engineer and manager of coal operations for the Pacific Coast Coal Co., died June 7 after a brief illness. Mr. Smith had been associated with the Pacific Coast Coal Co. for the past 48 years.

Edgar Lewis Rossin, 47, vice-president of Miami Copper Co. and a board member of Tennessee Copper Co., died after a heart attack early this August near Santa Fe, N. M., while on a fishing trip. Mr. Rossin was born in New York City and received a degree from Columbia University Graduate School of Geology in 1924. He graduated from Princeton University in 1922.

Daniel Bagnell, 84, long prominent in mining circles as well as mining brokerage activities in the state of Washington, died in August in Spokane, Wash. He served as head of the Spokane Mining Exchange from the turn of the century until a few years ago, when he suffered from heart trouble and retired.

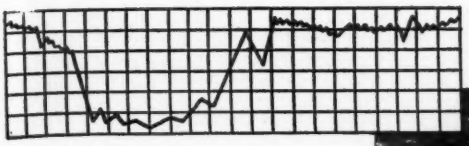
Percival Page Butler, 71, mining and metallurgical engineer, died at his home in El Paso, Tex., on September 2. Butler, a native of Montreal, Canada, was for many years connected with Canadian Copper Refiners Ltd. At one time he served as superintendent of the Copper Queen Smelter, Phelps Dodge Corp., at Douglas, Ariz., and more recently has been a member of the Phelps Dodge Refining Co.'s staff at El Paso.

Harry H. Barber, 70, chairman of the board of the Barber-Greene Co., Aurora, Ill., and one of the pioneer designers of modern construction equipment, died September 6.

Mr. Barber, whose inventive genius was reflected in various machines and methods for material handling, ditch digging, and road construction, retired as president of Barber-Greene in 1945 to become chairman of the board.

In 1940, Mr. Barber was presented the Pioneer Award by the National Association of Manufacturers in connection with a nation-wide observance of the 150th anniversary of the founding of the American patent system. During the war, scores of airports were built all over the world with the help of machines which Mr. Barber designed.

Mr. Barber's influence as an ethical and original designer has been and will remain an inspiration to men in the construction and industrial fields.



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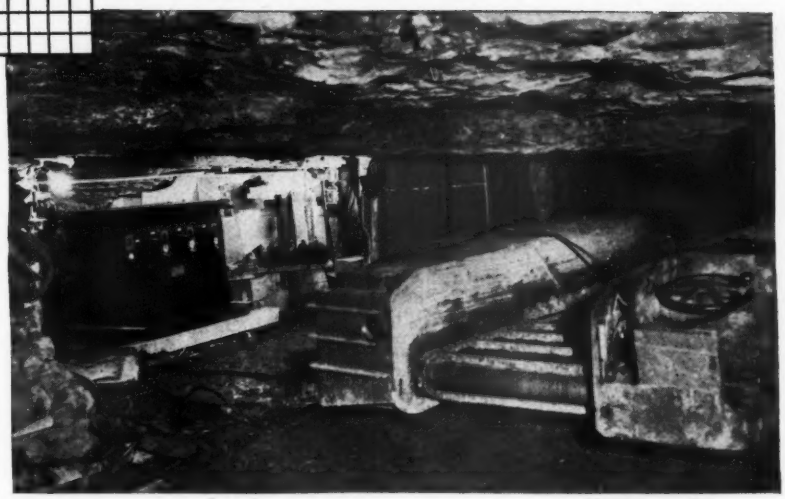

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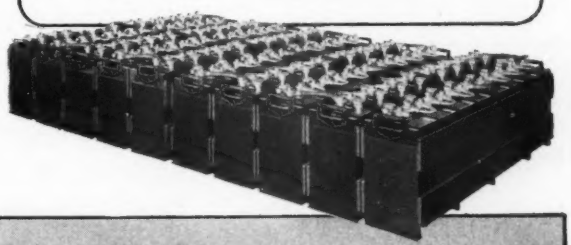
- ★ They can be **charged rapidly;** do not require critical adjustment of charge rates; can be charged directly from mine d-c supply.
- ★ They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- ★ They can **stand idle indefinitely** without injury, without attention, and without expense.
- ★ They are **simple and easy to maintain.**



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Morgantown Lock and Dam Construction Begun

Ground-breaking ceremonies were held September 9 in Morgantown, W. Va., marking the beginning of construction of the $6,343,650 Morgantown Lock and Dam. The new dam will throw open the coal fields around Morgantown for the first time to shipment of coal by water to Pittsburgh and points beyond, and will link the town's industrial economy with that of the entire Ohio River basin. The ceremony was attended by Gen. J. C. Mehaffey, Col. F. H. Falkner, Sen. Chapman Revercomb, Rep. Melvin C. Snyder, and Carl B. Jansen, president of Dravo Corp.

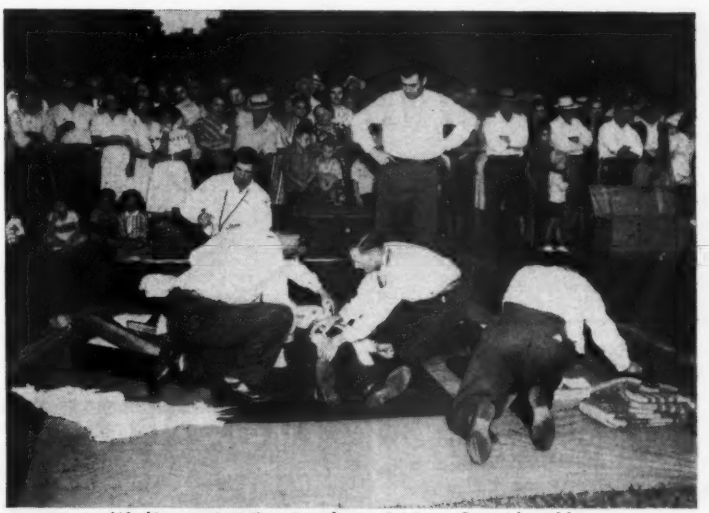
Coal Mine First-Aid Contest

Winner of the first-aid contest climaxing the Coal Miners' Accident and Safety meet held August 14, at Bridgeport, Ohio, was the first-aid team of the Wheeling Township Coal Mining Co. The winners had a 99.73 percent perfect score in solving three distinct first-aid problems in competition with 12 other contesting units from eastern Ohio coal mines. The teams of the Piney Fork No. 1, Hanna Coal Co.; Dun Glen mine, Hanna Coal Co.; and of the Wolf Run mine of Warner Collieries, were runners up for first-aid honors. All four earned the right to compete in a similar statewide event to be held at Columbus, Ohio, next spring.

The first-aid problems were prepared under the direction of George Grove, supervising engineer, U. S. Bureau of Mines, chief judge for the Bridgeport contest. The contest was sponsored by the Division of Safety and Hygiene of the Industrial Commission of Ohio, in conjunction with the safety director of the Coal Operators of Ohio and the United Mine Workers of America, District 6. A total of $6,500 in prizes was awarded in connection with the event, including $100 watches presented to each member of the winning team.

MIT Expands Radioactive Tracer Research

The department of metallurgy at the Massachusetts Institute of Technology is expanding its research on the application of radioactive tracer techniques to mineral engineering problems, under a grant from the research division of the United States Atomic Energy Commission. The new program will make it possible to carry on fundamental research which is expected to be of special value to the mineral industry in advancing fundamental knowledge on the mechanism of flotation, the leaching of metallic ores, the reactions encountered in the smelting and refining of metals and other related processes. Many graduates will have an opportunity to carry on scientific research while working for advanced degrees, and experienced men in the field will have the advantage of employing the newer techniques in the use of radioactive substances. The project is under the



Working against time to solve an intricate first-aid problem

direction of an advisory board composed of Dr. Bruce Old, of Arthur D. Little, Inc., and the Atomic Energy Commission; Profs. Antoine M. Gaudin, Reinhardt Schuhmann, Robley D. Evans, John W. Irvine, Martin J. Buerger; and John Dasher, of the Division of Industrial Cooperation.

Synthetics Research Program

An agreement under which the Gulf Oil Corp. and Koppers Co., Inc., will engage in cooperative research and development of processes for the conversion of coal to gas and liquid fuels, has been announced by the two companies. By joining forces and combining knowledge of liquid and solid fuels, the two companies hope to develop more promising industrial processes for converting solid fuels into gases and synthetic liquid fuels. The cooperative program may further lead to establishment of pilot-plant facilities to further research.

Koppers Co., Inc., has also announced the establishment of a new chemical section to supervise and coordinate engineering and construction work on plants which will produce oxygen, synthetic fuels, and certain types of chemicals. The section will be headed by T. M. Osborne, former assistant manager of the control section.

Promotions at Consolidation Coal Co. (W. Va.)

Consolidation Coal Co. (W. Va.), lists the following promotions:

In the Clarksburg mine, Jack Light and Berlin A. Wright have been promoted to section foremen. In the Owings mine, Paul F. Watson and French Richards have been promoted to section foremen. Raymond Lgoue has been promoted to section foreman in the Fairmont mine. Peter W. McGraw and Ralph J. Mick have been promoted to section foremen in the Monongah mine. In the Jordan mine, E. W. Ramsey and Paul Zickefoose have been promoted to section foremen. James G. Thompson has been promoted from section foreman to assistant mine foreman at the Nora mine. At the Everettville mine, Frank L. Berry was promoted from section foreman to mine foreman and Charles E. Herndon was promoted to assistant mine foreman.

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Hanna Coal & Ore Co. Deepens Shaft

At its iron property at Clifton, N. Y., the Hanna Coal & Ore Co. is sinking its shaft to open a new or second level at this magnetite mine. The mine was originally opened as an open pit but the method was later changed to underground mining.

Eastern Coal For Japan

C. G. Sprague & Sons Co. is under contract to ship 200,000 tons of coking coal to Japan. The bulk of shipments will be made through Hampton Roads, Va.

Staff Changes at Benson Mines

J. C. Madson has retired as general superintendent, Benson mines, Jones and Laughlin Ore Co., after 35 years with that company. Mr. Madson was connected with Inter-State Iron Co. in Minnesota before taking charge of the Benson mines operation in 1942. William R. Webb, assistant general superintendent of Benson mines will succeed Mr. Madson as general superintendent. Mr. Webb was formerly production superintendent at Blair Limestone Division, Martinsburg, W. Va.

J. O. Peterson, chief clerk at Benson mines, has been transferred to Inter-State Iron Co. Wallace J. Fisher, Pittsburgh, will succeed Mr. Peterson as chief clerk at Benson mines.

Smokeless Soft Coal

In an attempt to find a solution to the problem of making soft coal smokeless, the Pittsburgh Consolidation Coal Co. is going forward with a $3,000,000 plant to render product that will eliminate the nuisance of excessive smoke. The product of the plant will be Disco-balls, a soft coal with tar and other smoke-making impurities roasted out. The balls, almost pure carbon, will be sold for $17.10 a ton fob Pittsburgh—$3 or $4 a ton more than soft coal.

Battelle Institute Expansion

Construction of a new $500,000 laboratory building will be begun by Battelle Institute late this year with completion scheduled for 1949. The three-story structure will house 103 unit laboratories with large open areas for pilot-plant operations and will contain approximately 80,000 sq ft of space.

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Fulton Brattice Cloth is mildew, fungus, and rot resistant. Its uniform and lasting qualities and economy are well established. Fulton Fireproof Brattice Cloth is made in two weights, and in widths from 36 to 96 inches. Leading mine supply houses in all coal fields stock Fulton Brattice Cloth. Immediate shipments are available from our plant nearest you.

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Annual Conference of the Coal Division

Summit Hotel, Uniontown, Pa.—Tuesday, November 9, 1948

ALL who are engaged in coal mining—operators and manufacturers—are invited to come and take part in this meeting where reports of maximum interest to the industry will be presented by the Coal Division Committees for open discussion. The Conference will be for one day only—a morning session starting at 10:00 am, a business luncheon, and an afternoon session, concluding about 5:00 pm.

The reports will cover major operating phases of coal mining: costs and safe methods of pillar extraction; factors affecting the economy of full seam mining; transportation with combination track and belt haulage; prevention of gob fires in surface slate piles; underground power systems for mechanical mining; correlating the face operations of preparation, loading, and service haulage.

Hotel and Transportation

Hotel accommodations will be available to those who apply for reservations in advance—mentioning attendance at the Conference.

The Summit is on US Route 40, a regular stop of the Blue Ridge bus lines from Pittsburgh to Cumberland. A convenient railroad point is Connellsville, Pa., on the B & O main line from Chicago to Washington, where the hotel station wagon will meet any train arrival on 24 hours' request in advance.

Iron Mining Men Visit Strip Coal District

A GROUP of men from the iron range, responsible for the movement of a tremendous yardage of rock annually, visited the anthracite coal region in the vicinity of Hazleton, Pa., for a two-day trip to a number of stripping operations on August 31 and September 1.

Included among the operations visited were the Beechwood stripping of the Correale Construction Co. for Philadelphia & Reading Coal & Iron Co.; the Locust Gap stripping by the Dick Construction Co., for Philadelphia & Reading Coal & Iron Co.; Swamptown stripping at Japan, Pa., by the A. E. Dick Contracting Co., Inc., for Jeddo-Highland Coal Co.; and the Drifton stripping at Drifton, Pa., by the Central Pa. Quarry, Stripping & Construction Co. for Jeddo-Highland Coal Co.

On September 1 they visited the Jeanesville stripping at Jeanesville, Pa., by the Yamulla Construction Co. for the Lehigh Valley Coal Co.; the No. 5 stripping at Audenried, Pa., by the Glen Alden Coal Co.; the No. 8 stripping by A. E. Dick Contracting Co. for the Glen Alden Coal Co.; and the Tamaqua stripping by Carey, Baxter & Kennedy for Lehigh Navigation Coal Co. In addition to the stripping operations visited, the group had the privilege of seeing the St. Nicholas breaker of the Philadelphia & Reading Coal & Iron Co. and the skip hoist at the Coaldale mine of the Lehigh Navigation Coal Co. In attendance from the iron ranges were: Jerry Machamer, vice-president and general manager, Oliver Iron Mining Co., Duluth, Minn.; Walter Sterling, manager, Minnesota Mines, Cleveland-Cliffs Iron Co., Hibbing, Minn.; Kenneth Duncan, assistant manager, Pickands Mather & Co., Duluth, Minn.; Edwin A. Friedman, general superintendent, Oliver Iron Mining Co., Coleraine, Minn.; and Grover Holt, chief engineer, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

group on its conducted tour. Operators gave freely of information concerning methods and costs. Fine lunches and dinners were featured by the hospitable coal operators in the Hazleton, Pa., region, many of whom had been present on a recent trip when mining officials from the anthracite coal fields visited stripping operations on the iron ranges.

The two trips represented a splendid interchange of essential knowledge between coal and iron mine operators. Information gained by both groups from the two visits should be invaluable in forwarding the most efficient practices in the strip mining of coal and iron.

Fifteen-year Tamaqua stripping operation of Lehigh Navigation Coal Company

Inspection party pauses to examine the Mammoth Seam

Coal Operators' Association Moves

The Big Sandy-Elkhorn Coal Operators' Association has completed its move from Ashland to Pikeville, Ky., and new headquarters are on the lobby floor of the Hatcher Hotel. The annual meeting was held July 2 and all officers were reelected for the ensuing year. B. F. Reed is president; W. W. Goldsmith, vice-president; H. S. Homan, secretary; J. R. Hurt, treasurer. Joseph E. Moody of Southern Coal Producers' Association, addressed the meeting.

Safety Progress Made

Some progress has been made in reducing hazardous conditions in the nation's underground bituminous coal and lignite mines, according to Secretary of the Interior J. A. Krug in his report to Congress on safety in those mines, but further emphasis is necessary to insure greater safety and to remove the principal causes of accidents in underground mining operations. Approximately one-third of the violations of the Federal Mine Safety Code reported by Federal coal mine inspectors in the year ending June 30, 1948, were corrected completely and progress was made in eliminating another 15 percent of the deviations, leaving about half still uncorrected.

The larger mines of the nation complied more readily than the small mines in eliminating hazardous conditions, the report showed. Bureau of Mines inspectors examined 2184 large and small underground mines during the year. These represented an annual production of about 448,000,000 tons of coal and an employment of approximately 315,000 men.

Canadian Titanium Smelter

What may be the richest and largest titanium ore deposit in the world has been discovered in eastern Quebec by a subsidiary of the Kennecott Copper Corp. Close to 50,000,000 tons of ore have already been found and much remains to be explored. The deposit, 400 miles north of Quebec City at Canton Fetu, on the shores of Lake Tio, may quite possibly yield enough ore to eventually break the monopoly that India holds on the mineral.

Kennco Exploration Co., a subsidiary of Kennecott Copper, will develop the discovery under a license from the Quebec Government at an estimated cost of $150,000,000. Construction of a new titanium smelter at Sorel, Que., by Kennecott Copper and the New Jersey Zinc Co., will begin soon with operations scheduled for 1951 which will provide $5,000,000 to $10,000,000 worth of titanium slag for shipment to the United States. Kennco Explorations is also planning the construction of a 27-mile railway from the north shore of the Gulf of St. Lawrence into the mineral area and a refinery at Sorel, Que., to treat the ore electrolytically.

Coal Dumping Facilities Improved

A $450,000 program of improvements to the thawing plant will increase the Pennsylvania Railroad's tidewater coal dumping facilities at South Amboy, N. J., during the coming winter months. The addition of two new coal-fired boilers of 50,000 lb-per-hr steam capacity each and four new automatic stokers will increase the total rated continuous steam capacity from the present 120,000 to 175,000 lb per hr.

Anthracite Mines Go To Six-Day Week

Increased demands for hard coal combined with a low reserve tonnage warrant six-day-a-week operation by anthracite mines, and a number of mines are making this change. However, an acute shortage of coal cars may keep some companies from reaching this goal.

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Engineered flow of air sweeps out gas pockets, and air flow must be continuous, reliably directed by "Canton" Automatic Doors. Dissipating explosive air is one important function. Providing healthy, breathable air is another function that steps up productivity of every worker. Eliminating that trapper boy accident is another.

Insurance against accidents, increased haulage, continued speed ahead with "Canton" Automatic Doors make it imperative that every mine owner and manager investigate the economy proven by a quarter century of American Mine Door service.

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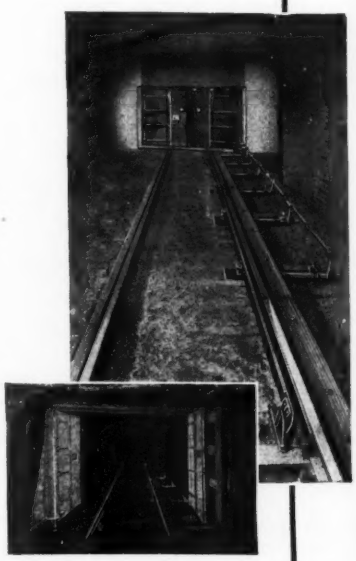

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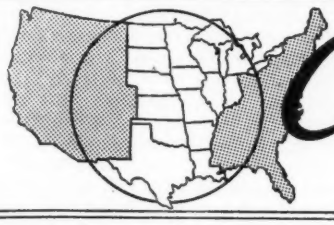

Central States

Quincy Mining Co. Has 100th Anniversary

Since beginning copper mining operations at Hancock, Mich., in 1848, the Quincy Mining Co. has produced over 714,000,000 lb of copper. The first dividend was paid in 1862 and to date $27,000,000 in dividends have been paid to stockholders.

Organization Formed to Mine Feldspar

Near Keystone, S. Dak., work has begun on the Eureka claims by the Ray Sanders Development Co. The mine has large feldspar deposits. George M. Madill, of Keystone, is directing operations at the claims.

Sulphur Plant Will Move to Mexico

An agreement has been made between the Mexican Gulf Sulphur Co. and the Jefferson Lake Sulphur Co. to explore and develop Mexican Gulf's sulphur properties in Mexico. Under the agreement, Jefferson Lake will immediately drill four wells in a sulphur deposit in Mexico and will move one of its sulphur plants, capable of producing 1500 tons per day, to Mexico in 1949.

Beneficiating Coking Coal

For the production of quality coal free from impurities such as slate and pyritic sulphur, the F. H. McGraw & Co., contractors, in association with the Nelson L. Davis Co. of Chicago, is building a coal cleaning plant for the Jones & Laughlin Steel Corp. at East Fredericktown, Pa., to process 28,000 tons of coal per day.

The vessel used to accomplish the sink and float separation is an invention of the Nelson L. Davis Co., and the recovery of the medium used in the vessel is by the process controlled by the American Cyanamid Co. The new $10,000,000 plant is expected to start production early in 1949.

Run-of-mine coal will be conveyed to the cleaning plant at the rate of 2400 tons per hour, to undergo an initial separation rejecting rock and leaving the float coal product to be retreated at a lower specific gravity for the separation and recovery of metallurgical coal from boiler coal.

A demonstration of this modern coal cleaning system was made in August at the Nelson L. Davis Co. pilot plant in Chicago with equipment which will be a part of the permanent coal cleaning system for the Jones & Laughlin Steel Corp.

U. S. Iron Ore Position

In the October issue of the *Reader's Digest*, Clarence B. Randall, vice-president, Inland Steel Co., stated that deposits of high grade Lake Superior iron ores will last for 40 years, and low grade ores for a much longer period.

Although non-magnetic ore reserves will last 100 years, even at peak demand, the utilization of magnetic ore will materially aid the supply of iron ore.

Mr. Randall pointed out that prevailing tax laws deterred development of new reserves inasmuch as ore goes on tax rolls as soon as found. "The shrewd operator tries to keep enough ore in sight so that his directors will feel comfortable and not enough to be ruinous in current taxes." In the State of Michigan, new deposits found by diamond drilling are held tax free for 10 years.

National Safety Congress and Exposition

The 36th National Safety Congress and Exposition, sponsored by the National Safety Council, will be held in Chicago from October 18 through October 22.

Wildwood Buys Old Northside Mill

The Wildwood Mining Co. has purchased the old Northside mill, northwest of Chitwood, Mo., from George W. Moore and associates, according to George W. Potter of Joplin.

The Wildwood Co. is stripping some old shallow "diggings" in the Roaring Springs hollow on the Wildwood ranch and the ore will be trucked to the Northside mill for treatment. At this time the mill is undergoing general repairs and reconditioning. Mr. Potter was formerly vice-president of the Eagle-Picher Mining and Smelting Co.

Nonferrous Smelter Completed

All facilities of the American Compressed Steel Corp.'s new smelting and refining works in Cincinnati have been completed and the new nonferrous smelter is now in production, according to an announcement made recently by Abraham Byer, president of the corporation. Smelting and refining activities are under the direction of Arthur B. Heinemann. General operations are under the supervision of Samuel Byer.

Federal to Dewater Tri-State Properties

The Federal Mining and Smelting Co. is reported to be unwatering its Duenweg mines in the Tri-State field which have been closed since cancellation of the premium price subsidy on zinc. It is estimated by Ward C. Ball, of Baxter Springs, Kans., the company's Tri-State superintendent, that six to eight weeks will be required to unwater the mine workings. Five pumps already installed will be operated to dewater the mines to a depth of 200 ft, and a sixth pump will be installed to speed up the project. Es-

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timated flow of water in the Duenweg area is 3500 to 4000 gpm.

General repairs will be made to the mill in preparation for the resumption of mining and milling operations. Approximately 100 or more men will be employed when full operations are resumed.

It was also announced the company is completing development work on its new No. 3 shaft on the Buffalo lease, a mile northwest of Quapaw. Sinking has progressed to a depth of 172 ft and the headframe and ore bin are being completed at the shaft site.

Strike Ends at Mine La Motte

On September 17 workers at the Mine La Motte of the St. Joseph Lead Co. returned to work under terms of the old contract. No new contract has been signed according to reports. An indecisive election was held on September 27 in which 2751 out of a total of 3031 of St. Jo's workers qualified to vote cast their votes with the following results: United Coke and Chemical Workers CIO, 876; Ozark Lead Workers Association, 838; neither, 1037.

Since the beginning of the strike on July 7, more than 25,000 tons of urgently needed lead production has been lost.

Steel Firms Buy Interests in Butler Brothers

A substantial interest in Butler Brothers, one of the largest iron ore operators on the Mesabi Range, Minn., has been purchased by the Armco Steel Corp., Inland Steel Co., Wheeling Steel Corp., and Hanna Coal and Ore Corp., a subsidiary of the M. A. Hanna Co. The Butler Brothers business will continue under the same name by the same operating personnel, but Hanna will assume supervision and management of the operation, as agent for the interested parties.

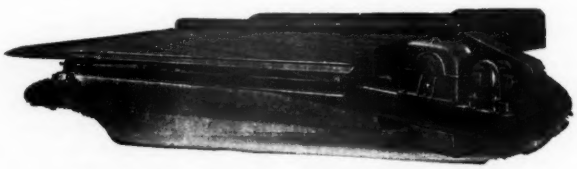
Five groups of mines are currently being operated by Butler Brothers and ship approximately 3,000,000 tons of ore annually. Large undeveloped ore reserves on the Mesabi and Cuyuna Ranges in Minnesota are held by the organization. In addition to the Butler properties, undeveloped properties owned by Hanna Coal and Ore Corp., will be included in the arrangement subject to fulfillment of outstanding Butler Brothers ore contracts. This tonnage in the future will be available for use by the steel companies participating in the purchase and will constitute a substantial addition to the raw material reserves.

New Toledo Coal Facility

Already more than 2,000,000 tons of coal have been dumped at Toledo's new coal and ore dock, an $18,500,000 joint facility of the Baltimore and Ohio and New York Central Railroads. When completed the new facility will have three coal-dumping machines, each capable of unloading the contents of 70-ton coal hopper cars into the holds of Lake vessels at a rate of one car a minute. Two unloading machines, each capable of removing ore from the ships, will unload the ships at the rate of 30 tons a minute.

Two of these coal machines and both of the ore dumpers are already in operation, and work is being speeded on three piers, the yards, the servicing facilities and the third coal dumper to rush it to completion. Two eastern trunkline railroads will be able to move as much as 20,000,000 tons of coal and 4,500,000 tons of iron ore during each shipping season to and from this new loading and unloading facility.

Two years of labor have already



Field Facts PROVE *Super Duty* Efficiency with "Out Front Performance"

Records of stepped-up efficiency from coal operators—large and small—endorse the amazing performance of SuperDuty "Diagonal Deck" Coal Washing Tables.

Capacities once considered optimum are economically increased, while maintaining maximum recovery of good coal at attractive minimum low ash and sulphur figures. This "Out Front Performance" which adds up to greater profit for the operator has been achieved through the scientific application of sound engineering principles.

Exclusive with SuperDuty tables is the smooth Concenco anti-friction bearing equipped Head Motion, which is integrally mounted on the main frame and complements the advantages inherent in the Diagonal Deck. These features, plus matchless operating economy, definitely place this table in a class by itself. For full information, write for Bulletin 119.

CONCENCO FEED DISTRIBUTOR

The Concenco Revolving Feed Distributor is a heavily fabricated, all steel machine, with motor drive requiring only ¾ H.P. in operation. This distributor effectively provides a splitting of feed into any desired number of equal portions. It is especially suitable for feeding efficiently a battery of coal washing tables.

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gone into the construction of the new docks. More than 2,500,000 cu yd of mud were dredged from the bottom of the naturally-protected bay to provide a 24 ft deep maneuvering basin with an average length of 2200 ft and a width of 600 ft.

Underground Shaker and Conveyor Belt Operation

(*Continued from page 22*)

chute operator, who turns on his light when he turns on his shaker and turns it off when he stops the shaker.

In addition to these signal lights, a series of red lights, one at the mouth of each transfer drift, are used to indicate whenever the belt is running or is about to run. These lights are also operated by the shaker-chute operator. Switches for stopping all the conveyors in an emergency are located at intervals along the main level drifts.

Production Increased with Lower Costs

Experience at the Sherwood Mine has shown that the maximum distances for economic moving of iron ore are up to approximately 100 ft for scrapers and tuggers, 100 to 200 ft for shakers, over 200 ft for belt conveyors. Experiments are being conducted with belt conveyors as auxiliary conveyors to be used in scraping and shaker contracts but no definite conclusions have been reached.

Some unsuccessful experiences have been had with shakers on this and on other ranges and there are conditions under which the shaker will not work. Experiments with the auxiliary belt in place of the shaker at the Sherwood Mine are based on a desire for auxiliary feeding equipment of greater length rather than unsuccessful experience with shaker operation.

With the present shaker chute-belt conveyor installation on the 1200-ft level of the Sherwood Mine the desired results are being obtained. Such results as decreased tramming and power costs, and increased production have been apparent. It is difficult to make a definite comparison from the safety viewpoint, but it is felt that the belt installation is less hazardous to the men operating this equipment.

The location and continuity of the orebodies at the Sherwood Mine favor belt-conveyor installations. Since all drifts for belt haulage must proceed in straight lines from their starting points, unless additional transfer points are used in the belt system, it is necessary that the ore be readily accessible from the main haulage drifts. When the Sherwood 1200-ft level was planned the orebody locations were fairly well known and the east and west drifts were planned so as to follow the orebodies.

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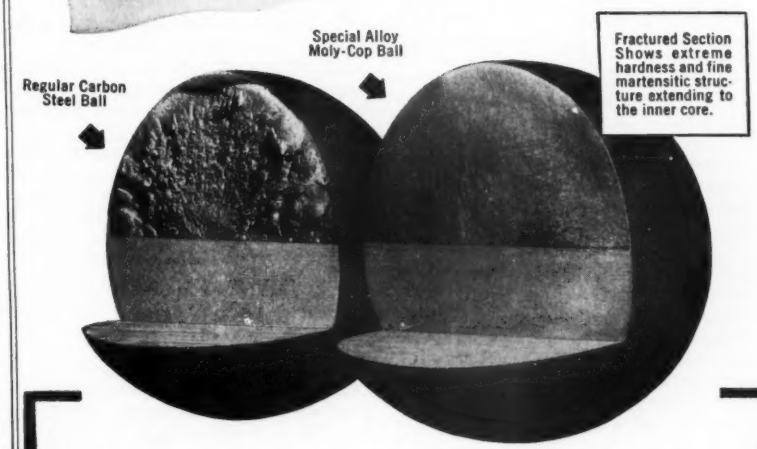
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International Mining Days

From October 24 to 27, mining men will again meet at El Paso, Tex., to celebrate International Mining Days with a program considering up-to-the-minute technical problems and a series of social functions. This year's meeting will be held in conjunction with the regional meeting of the AIME.

Headquarters will be located at the Cortez Hotel in the heart of El Paso. In addition to entertainment, planned field trips have been organized to take attendants at this annual occasion to the heart of the mining and smelting district in northern Mexico, the potash mines of New Mexico, and the important mines of the Silver City area.

An excellent program has been planned by the minerals beneficiation division of the AIME with J. H. Myers serving as chairman. The information gathered at this meeting will be an extension of the successful program held at the 1948 Metal Mining Convention of the Western Division of the American Mining Congress.

E. McL. Tittmann is chairman of the International Mining Days for 1948. He is assisted by an active committee made up of Homer C. Hirsch, R. S. Beard, E. M. Thomas, E. P. Neugebauer, L. G. Hetrick, T. J. Woodside, and J. E. Despins.

New Pit Facilities Planned

In a joint announcement, D. D. Moffat, vice-president, Utah Copper Division of Kennecott Copper Corp. and F. S. Mulock, vice-president and general manager, western operations, United States Smelting, Refining and Mining Co., described a new and expensive project which will be begun soon to enable Kennecott Copper Corp. to extend its open-pit mining operations. A new 4-mile tunnel will be driven from a position near Lark townsite to the USSRM workings to connect with U. S. Co.'s Niagara No. 2 shaft on the 1000-ft level. The new tunnel will give both companies a deep outlet.

Three years will be required for completion of the new project which will replace the present handling facilities. Transportation through the tunnel will be by trolley, and storage battery locomotives on a 36-in. gauge track. The new project includes removal of the USSRM surface plant in Bingham Canyon to the portal of the new tunnel near Lark.

Great Falls Plant Resumes First-Aid Training

AN important phase of the accident-prevention program of the Great Falls, Mont., reduction department of the Anaconda Copper Mining Co., has been the training of first-aid teams. During the war years it was necessary to discontinue this work due to the shortage of manpower and the necessity for increased production of vitally needed metals. Due to a gradual improvement of conditions, it was possible to resume team training this year on a limited scale.

Nine teams, composed of six men each, recently completed a six weeks' course of first-aid training. On June 12, the teams met in competition at the Ice Arena of the Great Falls Civic Center. Cash prizes amounting to $500 were awarded proportionately to the winning teams and first-aid kits and medals were received by all team members. All teams were examined by representatives of the Bureau of Mines and first-aid certificates issued to each team member. Shop Team No. 2, captained by Maurice Muzzana won top honors in this contest with a score of 99$^{3}/_{15}$ percent. The zinc plant tankroom team, captained by Joe Parr, was a close second with a score of 99$^{2}/_{15}$ percent. The wire mill team under Capt. Jas. Keenan, and the zinc plant cadmium team, captained by Walter E. Fox, tied for third place with a score of 98$^{14}/_{15}$ percent.

Since team training was started in 1923, the Great Falls teams have taken part in three international first-aid contests, winning first place that year in Salt Lake City. In 1925 Great Falls took third place at the contest held at Springfield, Ill., but came back strong again in Butte in 1928 by winning both first and third places.

Another imporatnt phase of the Great Falls reduction department's safety campaign are the safety meetings which are held at least once a month in each department. At these meetings the employes are urged to report hazardous conditions and unsafe working habits and practices, and to suggest ideas for the advancement of accident prevention.

It is the intention of the management of the Great Falls plant to continue the training of first-aid teams each year. Trained men not only give valuable assistance in caring for actual accident victims but are much more safety conscious than the average untrained worker.

Sulphur Mill for Wyoming

The state of Wyoming has cleared the way for construction by the Texas Gulf Sulphur Company, of a $3,000,000 dollar plant at Worland. The plant will employ some 100 persons.

Team judges, consulting judges and timekeepers at Great Falls first-aid meet. Kneeling, left to right: Rudy Parock, John Boardman, William Treweek, Dan McElhattan, Ernie Bowen. Standing: Silvio Tinelli, Lawrence Duncan, Raymond Lipton, David Lawlor, Walter Needham, R. H. Miller, Mr. Worcestor, Alex MacDonald, R. W. Fatzinger, Rolla Clements

New Acid Plant in Washington

On October 1, construction began on the new $1,000,000 plant of the American Smelting & Refining Co., at Tacoma, Wash. The Tacoma manager, E. R. Marble, stated the firm's new plant will be for production of sulphuric acid, with a 100-ton a day capacity—largest of its kind in the Pacific Northwest. A year and a half will be given over to the building of the new adjunct to the big smelting organization on the shores of Puget Sound.

Central Eureka Resumes Operation

After a long mine rehabilitation program the Central Eureka Mining Co. at Sutter Creek, Amador County, Calif., is resuming milling operations. The power shortage last spring combined with the lack of experienced men effected delays in the completion of the rehabilitation program. The wage increase granted December, 1947, has attracted experienced men to the mines. Mill production at the rate of 200 tons per day has been started on ore stockpiled from development work and a trial stope.

According to C. C. Prior, the condition of the mine is the best in its history. C. W. Plumb was made general manager of the Sutter Creek properties in May 1948.

Washington Chromite Development

American Chrome & Magnesium Industries, Inc., headed by Alwyn H. Wild, launched in September the first commercial development of the vast olivine deposit in the Twin Sisters region of the Cascade Mountains, in Washington State. The deposit also contains chromite.

As the first step in the development, the company signed a long-term lease with the port of Anacortes, Wash., the nearest deep-water harbor to the Twin Sisters Mountain.

The program outlined by Mr. Wild is in three stages:

(1) Construction of the chrome beneficiating and briquetting plants at Anacortes and processing of chrome briquets from chromite ore brought from South Africa.

(2) Treatment of chromite from the Twin Sisters region after concentration near the mining area.

(3) Ultimately, reduction of magnesium at Anacortes from the company's olivine.

The company reports that it controls the mining rights of over 4000 acres of olivine-chromite mining claims in the Twin Sisters range. Contracts have been awarded for diamond drilling of the chrome area to Lynch Bros., of Seattle. Contracts have been awarded for construction of a road to the principal Twin Sisters chrome deposits and for construction of camp facilities.

The concentrating mill planned will have a capacity of 1250 tons a day. Here olivine-chromite ore, obtained by open-pit mining, will be processed. The company has a government contract to stockpile 200,000 tons of chrome briquets. Half this tonnage it plans to produce from foreign ore and half from Twin Sisters concentrates.

Utah Firm Gets Shale Drilling Contract

The Bureau of Mines recently awarded a $43,897 contract to Boyles Brothers Drilling Co., Salt Lake City, for exploratory drilling on the naval oil-shale reserves in western Colorado. The contractor was expected to set up a camp on the high plateau northwest of Rifle, Colo., and start drilling by September 1. Seven diamond core drill holes, ranging in depth from 570 to 1200 ft, must be completed within 15 months.

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War Plants Purchased

Phelps Dodge Corp., on August 10, 1948, exercised its option to purchase from the Reconstruction Finance Corp. the extension to the reduction works and other facilities at Morenci, Ariz., and the extension to the refinery at El Paso, Tex. These extensions were constructed by the Government during World War II.

It is estimated that the deal involved approximately $19,000,000 since the Government stated that the sale had been made at a "full recovery of cost to RFC." Louis S. Cates, chairman of the board, and Robert G. Page, president of Phelps Dodge, have stated that no financing will be needed for the purchase as funds had been provided out of accumulated earnings.

Bagdad Plans Increased Production

The Bagdad Copper Corp., of Bagdad, Ariz., hopes to increase its production rate following the recent receipt of an all-electric 5-yd P&H shovel. For several months Bagdad has been producing at the rate of 90,000 tons of copper ore monthly from the open-pit section of its mine. All work is on a three-shift basis with a crew of 250 men.

In the immediate future Bagdad will start the construction of 40 new homes for its employes. These houses are to be erected at New Town Strike, just outside of Bagdad, according to an announcement by E. R. Dickie, manager.

Pend Oreille Expansion Plans

The Pend Oreille Mines & Metals Co., in which Hecla and Bunker Hill, through their subsidiary company, the Sullivan Mining Co., recently purchased a $3,500,000 interest, is planning facilities for treating approximately 1,000,000 tons of zinc and lead ore yearly. The company now has one 750-ton capacity milling plant in operation and are building two other 1000-ton plants. The mines are located at Metaline Falls, Wash., and in British Columbia.

Washington Coal Producers Elect Officers

Charles F. Larrabee, of the Roslyn-Cascade Coal Co., has been elected president of the Coal Producers Association of Washington. Other officers are Earl R. McMillan, of Northwestern Improvement Co., first vice president; William Strain, of Strain Coal Co., second vice president, and James E. Ash, of the Association's Seattle office, secretary-treasurer.

Trustees elected are Fred Bianco, Bianco Coal Mines; Harry Merbach, Bellingham Coal Mines; Earl Maxwell, Pacific Coast Coal Co.; David J. Williams, Big Four Coal Co.; George W. Sheatley, Monarch Coal Co.; and Thomas Murphy, Northwest Improvement Co.

Dr. H. G. Yancy, of the Bureau of Mines, Seattle, principal speaker at the annual meeting, told of the Bureau's program on the liquefaction and synthesis of fuels from coal.

New Cornelia Plans Mill Improvements

According to an announcement by Ernest Wittenau, manager of the New Cornelia Branch, Phelps Dodge Corp., Ajo, Ariz., authorization has been given for a $500,000 improvement program to increase the efficiency of the milling plant. Included in the improvements will be a 54-in. crusher, to replace the present 48-in. crusher, and a new thickener.

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Bureau of Mines Laboratory Opens

On August 25, the Bureau of Mines opened its $550,000 laboratory building at Laramie, Wyo., a part of the Bureau's petroleum and oil-shale experiment station. The "open house" was delayed for more than a year after completion of the building so that experimental equipment worth $350,000 might be in full operation.

Morning Glory Mines

The Morning Glory Mines, Inc., with head office in Spokane and whose Haywire and Keystone mines are located north of Troy, Mont., near the Idaho state line, recently reported to its stockholders that its 100-ton flotation mill was nearing completion and would commence operations within 30 days. Ore bins of 400-ton capacity have been erected below the portal of the Ammann tunnel and at the mill. Results of development has shown excellent bodies containing gold, silver, lead, and zinc. Stoping has begun in some cases and ore stored in chutes is awaiting milling.

Ruth Pit Extended

The great task of stripping overburden of some 50,000,000 tons at one end of the great pit at Ruth in the Ely district of Nevada has been completed, uncovering ore reserves for the next ten years of power-shovel mining. Underground mining of ore by caving methods continues at the Star Pointer shaft and at the Morse Brooks shaft.

Sunshine Cuts Yankee Girl at Depth

The Sunshine Mining Co. has cut the Yankee Girl vein system on the 3700 level, 1000 ft below sea level, proving a vein 8 ft wide of 50 oz silver per ton. The only other opening on this vein is on the 3100 level, where the Sunshine has been stoping for several months on an ore shoot 750 ft long averaging about 20 oz per ton. Metropolitan Mining Co. owns a 16th interest in the operation.

New Park Hits Bedded Ore

Exploration on the New Park Mining Co. property in Utah has resulted in the discovery of the first bedded ore known to be on the company land, W. H. H. Cranmer, president, recently announced. Assaying at $42 a ton, the ore yields higher than the $26 a ton of the current output from fissured ore bodies. The discovery was made by raising from the main works at the 1020-ft level into the limestone in which the bedded ore is located. New Park production at present is from fissured diorite, which yields lead, zinc, gold, and silver. The new ore body contains only lead and zinc, in approximately equal proportions, according to Mr. Cranmer.

Kennecott Scholarship

Kennecott Copper Corp. has established a $750 Annual Scholarship starting with the 1948 fall term in the New Mexico School of Mines at Socorro, N. M. It will be given to the most promising senior student in mining engineering and the award will be made on the basis of scholastic standing, leadership, initiative, and ability to direct and stimulate others.

Placer Ground Development

The Cal-Creek Placers, Inc., of 1537 Cole Street, Enumclaw, Wash., has launched a program to develop some 800 acres of virgin placer ground. This development will follow on the heels of sampling which has taken place on the holdings in the heart of central Idaho between Florence and Warren. These places have enjoyed noteworthy gold production in the past.

For Sale

One 20-A Conway Mucker, 25 H.P. DC Motor, overhauled, with new belt.

Inquire ROBERT D. MURPHY
Rock Springs, Wyoming

Fluorspar Strike Reported

A new strike at the Superior, Mont., property of the Coeur d'Alene Extension Mines, Inc., Wallace, Idaho, was reported recently by F. E. Scott, secretary-treasurer of the firm. Fluorspar ore of high grade has been opened up for a distance of approxmiately 75 ft. Development is being pushed to determine further extension and magnitude of the deposit.

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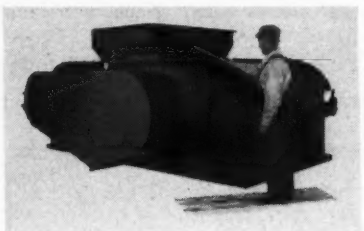
Manufacturers Forum

New Double Roll Breaker Announced

McNally Pittsburg is now producing a Gearmatic drive heavy-duty, double-roll breaker with a capacity range from 750 to 1400 tph, depending on product size, which ranges



from 6 to 14 in. Crushing roll teeth are of the flat-face design introduced on previous heavy-duty breakers produced by the company. The full-floating Gearmatic drive principle follows the design of the stoker coal crusher introduced in 1946. Performance runs made at an operating mine are reported to have given accurate sizing, easy adjustability, and high mechanical efficiency.

Plastic Battery Case

More starting power with less space and weight than any other nonspill, lead-acid battery in production, is claimed for an Exide storage battery manufactured by the Electric Storage Battery Co. The special battery has a transparent polystyrene plastic case. The battery is rated at 24 v and is capable of producing 15 hp for 3 minutes. The container permits a ratio of power to cubic content and weight greater than heretofore possible.

Eliminating Twist in Wire Rope

Swivels originally designed to remove the torque from glider tow ropes are now available for industrial use. The Miller anular ball-bearing swivels have been designed and developed by General Machine & Welding Works, Pomona, Calif. The full use of the entire bearing surface of three ball races makes it possible to turn a 32-lb swivel under 77,000 lb load by merely grasping it with the thumb and forefinger. A variety of sizes are available for different types of duty.

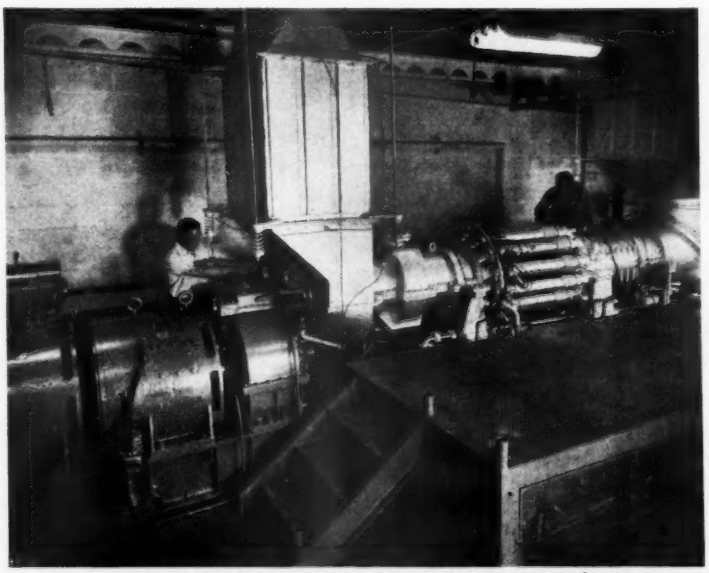
High-Tension Conveyor Belt

For belt tensions running as high as 1000 lb per in. of width—almost double that of 48-oz cotton fabric—the Hewitt Rubber Division of Hewitt-Robins, Inc., has announced a new fabric conveyor belt called Raynile. The combination of rayon and nylon is claimed to offer greater strength than the standard types of cotton woven fabrics or cotton cord belts. The new belt is said to include among other features excellent transverse flexibility, minimum stretch in actual operation, and field splicing made easy because of fabric construction. The new belt is being located in a number of installations throughout the country where belt life and belt maintenance will give a good cross-section of the comparative value of this belt with previous cotton-reinforced conveyor belt.

Gas Turbine Goes Into Industrial Service

Arrangements have been completed for shipping the 2000-hp combustion gas turbine that recently completed more than 1000 hours of test operation at the Westinghouse Turbine Division, Westinghouse Electric Corp., to the Mississippi River Fuel Corp., where it will go into service driving a compressor on the natural gas line between Monroe, La., and St. Louis, Mo.

This is expected to be the first industrial application of a mechanical drive combustion gas turbine in this country. The unit is said to produce more power per pound of weight than any other present-day power plant. It requires only a simple, inexpensive concrete mat foundation and can be trucked into remote undeveloped regions for quick erection and operation within a few hours. It needs no water and only a small amount of lubricating oil. Maintenance problems are minimized because of the few moving parts.



Gas turbine shown in test operation will soon be in commercial service

More Power Per Pound

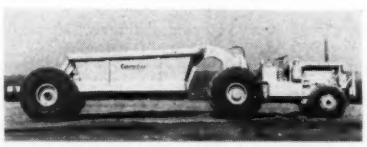
With the introduction of a new Cummins Diesel, designated the HR-600 engine, the Cummins Engine Co., Inc., continues the Cummins trend towards "more power per pound" initiated with the introduction of the H-600 engine in 1932 and continued with the NH-600 engine of four years ago. The new Diesel engine is based on the well-known Model H, yet develops ten percent more horsepower. Production began on the new unit during September.

The HR-600 engine develops a maximum of 165 hp at 1800 rpm. Like all Cummins Diesels, the HR-600 has a four-stroke cycle and the exclusive Cummins fuel system.

The new HR-600 is available in an automotive model, three industrial models, and a marine model. Field conversion to HR-600 from H-600 can be made by Cummins dealers. Steps involved include boring the present block and installing HR-600 pistons and liners and the optional installation of the new increased-flow lubricating system and continuous groove bearings. The manufacture of all existing models of Cummins Diesels will be continued.

Caterpillar Adds to Existing Lines

Ten new additions to the number of products of the Caterpillar Tractor Co. are already beyond the design and research stage and will be placed in volume production as quickly as current expansion of manufacturing facilities permits. For the first time, the company is going to produce 500 hp Diesel engines and two-wheeled, self-propelled scrapers.

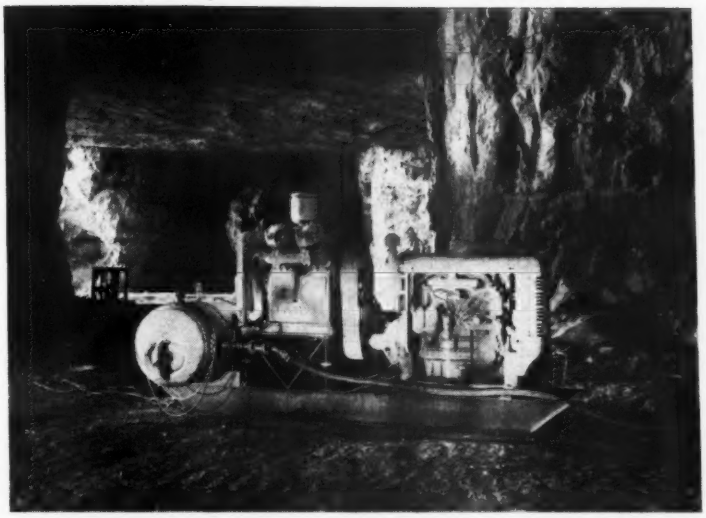


Four-wheeled Diesel tractor wagon

Nearly every type of earth-moving equipment for any specific type of duty will soon be available in a Caterpillar unit. A new four-wheeled Diesel tractor-wagon, two additional scrapers, and four new Diesel engines for industrial power units are among the array of matched design products.

Carbide Tipped Bits

A new line of drill and cutter bits tipped with Firthite sintered tungsten carbide for use in coal mining, was recently announced by Firth Sterling Steel & Carbide Corp. Similarly tipped bits for use in hard rock mining were first displayed to the industry at the 1948 Metal Mining Convention in San Francisco.



Skid-mounted Sullivan compressor driven by an International Diesel engine in use underground by the Warren Limestone Co., near McMinnville, Tenn.

Pilot models of the new Firthite-tipped mining tools have been in experimental use in both coal and metal mining where they have demonstrated that they are capable of making production records comparable to those of metal-working, carbide-tipped tools that have revolutionized machine shop practice during recent years.

Aluminum Track Jack

An aluminum alloy housing on a new simplex track jack recently brought out by Templeton, Kenly & Co., provides light weight and easy handling. A 40 percent increase in size of all housing sections is said to provide strength and durability equivalent to malleable iron housings. The new jack, designated as No. A-17, is engineered to lift its full 15-ton capacity on the large forged toe. The unit weighs 41½ lb.

Earth Moving Film

"Euclids Move the Earth," a new full 16-mm sound film covering Euclid's complete line of off-the-highway earth-moving equipment has been released by the Euclid Road Machinery Co. The film shows the various applications of heavy-duty, earth-moving equipment in metallic and non-metallic strip mines and a variety of other uses.

The film requires 30 minutes for showing. Parties wishing to present this film may apply to Euclid representatives, distributors, or directly to the sales development department of the home office.

— *Announcements* —

G. A. Gilbertson has joined the **Frank G. Hough Co.** as vice-president. Mr. Gilbertson was formerly assistant sales manager of the Industrial Power Division of the International Harvester Co.

* * *

Lester B. Hamersley has been appointed sales promotion manager of **Firth Sterling Steel & Carbide Corp.**

* * *

J. F. Ginna has been appointed assistant to the vice-president in charge of production for the **American Car and Foundry Co.**

* * *

S. R. Zimmerman, Jr., has been named director of friction material research and development for **Raybestos-Manhattan, Inc.**

A. J. Roubal has been promoted to the position of staff development engineer of the basic industries machinery department of **Allis-Chalmers.**

* * *

R. K. Gottshall, formerly director of sales of the explosives department of **Atlas Powder Co.,** was appointed assistant general manager on September 1. **W. E. Collins, Jr.,** succeeds Mr. Gottshall as director of sales. **George W. Thompson** was transferred to Seattle as manager of the sales office in that district for the company.

* * *

Thomas A. Cantrell has been appointed district manager of the **Euclid Road Machinery Co.** for western New York and the Canadian Provinces of Ontario and Quebec.

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